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THE

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TIME AND CAUSALITY

I

THE revival of nominalistic empiricism in contemporary philosophy of science has naturally borne with it a refurbished correlational interpretation of causality.[1] But the mathematical development of the physical sciences has profoundly modified the correlational view. In place of Hume's uniform sequences of perceptions we now have equations (especially differential equations) expressing constant relations between variables. This may still claim to be in the Humian tradition in that it involves no appeal beyond the empirical scenes to any mysterious production of effect by cause or to any necessary connection between the two. But it has definitely dropped out an empirical aspect of causality considered essential by Hume, *viz.*, the temporal disparateness of cause and effect, the fact that causality has a temporal direction. In place of a sequential relation between cause and effect, it puts a functional (*i.e.*, mathematical) relation between values of variables. "So science does not speak of causes and effects, but of functional relations between measurable quantities; it starts with measurements of quantities rather than with description of occurrences."[2]

Now if this view simply means that physical science has not discovered any fruitful method of dealing with the causal relation, and so has neglected it and emphasized functional relations, I have no objection. But if it means that causality can really be reduced to functions expressible in mathematical equations, I find myself in disagreement. For there is an undeniable empirical fact, his-

[1] I was particularly impressed with this in reading several of the papers in *Causality*, University of California Publications in Philosophy XV.
[2] Moritz Schlick in *op. cit.* III.

torically designated by 'causality', which involves *essentially* the characteristic of temporal direction. Heat is generated appreciably *after* friction commences; birth occurs *after* copulation, etc. This is obviously true in irreversible processes; it is just as true in reversible processes. I break up water into hydrogen and oxygen, and then recombine the latter into the former. In each of these processes the product occurs only *after* the source has ceased. There is a *temporal direction*, and the *same* temporal direction, in both processes (*i.e.*, it is not the temporal order of cause and effect, but that of substances, which has been reversed).[3] What has traditionally been known as the causal relation contains the empirical factor of temporal direction not expressible in functional equations.

Some adherents of the correlational view in its mathematical form have at least suggested that it can furnish a meaning for the aspect of temporal direction involved in the empirical fact of causality. Consider Moritz Schlick's position.[4] As we have seen, he claims that scientific laws state functional relations, and hence drop out the categories of cause and effect. But he seems to retain the factor of temporal direction by his emphasis upon the foundation of law in prediction: ". . . a Law is a formula which allows us to make true predictions."[5] A scientist is not satisfied that he has a law when he has discovered a functional relation in his data. As a matter of fact, there are no conceivable data for which he could not find functional relations (if these relations can be of any degree of complexity). The scientist is satisfied that he has a law only after he has found that a functional relation constructed from certain data holds when applied to *new* data. Now if Schlick here is treating temporal direction as essentially involved in physical law (as seems indicated by 'new' data and 'prediction'), his view seems obviously a confusion. It is a confusion of the requirements of our verification of an hypothesis as to a law (which process of verification does involve temporal direction) with the character of a law

[3] The cause of the production of hydrogen and oxygen was not the water but the electrolysis of the water, whereas water, not the electrolysis of water, was the effect of the ignition of the mixture of hydrogen and oxygen. *Cf.* a criticism of Hamilton by Mill in *An Examination of Sir William Hamilton's Philosophy* II 35.

[4] In "Causality in Everyday Life and in Recent Science", *op. cit.* 99-125.

[5] *Ibid.* 120.

as a true law of nature (which is wholly irrelevant to time, if we are to accept the functional view).

V. F. Lenzen[6] tries to find in the differential equations of physics correlates of the features found in the common conception of causation. For example, take the equation:

$$m_1 \frac{d v_1}{d t} = \frac{G m_2 m_1}{r^2}$$

The lefthand side represents the acceleration of a body, m_1. The righthand side represents a gravitational force in accordance with the Newtonian law. Lenzen claims that the effect is represented by the lefthand side, the cause by m_2. His choice of cause here is unfortunate. Any of the symbols on the right side has as much right as has m_2 to be treated as cause of the values on the left. But even if he had chosen $\frac{G m_2 m_1}{r^2}$ as a whole as the cause of $m_1 \frac{d v_1}{d t}$, the equational form would have given no basis for a preference of this as against making $m_1 \frac{d v_1}{d t}$ the cause and $\frac{G m_2 m_1}{r^2}$ the effect—for no temporal relation between either is indicated. This is recognized by Lenzen. By substituting the constant, g, for $\frac{G m_2}{r^2}$, and designating the distance m_1 falls toward m_2 by s, he gets the equation

$$\frac{d^2 s}{d t^2} = g,$$

which when integrated becomes

$$s = s_0 + v_0 (t - t_0) + \tfrac{1}{2} g (t - t_0)^2,$$

when s_0 and v_0 are the values of the distance and velocity at an initial time, t_0. "Thus if one knows the position and velocity at a given time one can calculate the position and velocity at some future or past time."[7]

This conclusion does follow, but, precisely since it does, it reveals that the distinction between cause and effect, as involving temporal direction, has been eliminated. For the equation allows us to calculate backward as well as forward in time—the direction of time is irrelevant. This irrelevance of the direction of time even

[6] In "Physical Causality", *ibid.* 69-96. [7] *Ibid.* 84.

in equations where time is a factor is perhaps obscured by a convention. A later time is represented by a larger number than is an earlier, and the passage of time is represented by the subtraction of the initial from the final time. Mathematically, this convention is wholly arbitrary, but empirically there seems to be more analogy between temporal passage and addition than between temporal passage and subtraction (of the elapsed, in relation to the initial, time).

Those modern adherents of the correlational view of causality who reduce causality to functional relations expressed by quantitative equations have thus eliminated the vital factor of temporal direction, and hence of change itself, from causality. But there are still those who cling to the more Humian position that causation means regularity of sequence of events. This view is correct so far as it *retains* the factor of temporal direction in causality. But it is incorrect so far as it *restricts* causality to that factor (even with the added qualification of regularity). The difficulties are well-known, but fundamental. Not all types of regular sequences are causal, *e.g.*, the sequence of day and night. Not all types of causality include enough known instances to make 'regular' have any significance when applied to them; *e.g.*, the final effect of the process summarized in the second law of thermodynamics is a universe in which no difference of energy-levels remains. Finally, the search for obstructing causes in cases where the sequence is irregular becomes a meaningless occupation; *e.g.*, the failure of the sun to give light during a solar eclipse; for, on the view under consideration, causes do not 'obstruct'—if a regularity is broken, *that* causal relation is shattered, whatever *other* regularity may be present.

W. R. Dennes, in "Causation as Continuity and Production",[8] has tried to meet these difficulties. His general answer seems to be that where there is regular sequence but not causality, the sequence is resolvable into, or analogous to, sequences which are not regular. For example, when we deny that the persistent crowing of a cock causes the sunrise, do we mean, he rhetorically asks, anything more than that "the processes of cockcrow and sunrise are analogous to, or hypothetically resolvable into, other processes which

[8] *Ibid.* 147-176.

are known as not exhibiting regularity of sequence?"[9] And the converse holds for cases of causality where there is no regular sequence. "Where we have evidence that justifies us in conceiving the processes we are studying as combinations of, or as specifically parallel with, processes we have observed and successfully predicted as regularly recurring, we may usefully say that the processes we are studying exhibit causal connexion even though their 'macroscopic' sequences are prima facie irregular."[10]

Dennes' appeal to analogy is particularly unfortunate and also particularly characteristic of positivists. No matter how analogous *in other respects* a regular sequence may be to an irregular, it is *not* analogous in respect to *regularity of sequence*, and it is the latter respect *only* which is relevant (on the view under consideration) to the question of causality. As to the resolution of a type of regular sequence into sequences which are irregular, I would answer that the correct interpretation (for the view we are considering) is not that the whole sequence is therefore not causal, but that the whole sequence is causal even though its constituents, so far as irregular, are not causal. In short, if one is going to identify causality with regularity of sequence, one should honestly do so—the rub is that such honesty brings one into conflict with experience.

Causality requires temporal direction, but it requires something further as well. This further factor may be provisionally stated as the relevance of cause to effect. And since, as I have argued elsewhere,[11] relevance always occurs within a concrete identity and hence involves sameness of essential characteristics, we may say that causality involves an identity of cause and effect. This (if you please) 'rational' requirement is emphasized by Morris Cohen in his *Reason and Nature*. "Hume is right in holding that to the extent that the impression of the antecedent and the impression of the consequent are different there is no real connection or necessary relation. . . . But the fact that antecedent and consequent are different does not prevent them from also having elements of identity. When we find such elements of identity we have real connection and a basis for necessary relations."[12]

[9] *Ibid.* 168. [10] *Ibid.* 170-171.
[11] In "Relevance and Scientific Method", *The Journal of Philosophy* XXIX, Sept. 29, 1932; and "Focalized Identity", *The Monist* XLIII 2, July 1933.
[12] *Op. cit.* 103-104.

But this factor of relevance and identity in causality may be overemphasized. When it is, the characteristic of real temporal passage, which we have seen to be essential to causality, is again eliminated. This, as I see it, is the basic sin of Émile Meyerson. His treatment of causality leaves no place for any difference between cause and effect, and thus automatically, as he recognizes, eliminates time. "We have explained the phenomenon, the change, in deducing the consequent from the antecedent, in showing that the consequent was necessarily what it was, *could not* have been different from what it was, because it was already implicitly contained in the antecedent. It simply explicated itself, unfolded itself, but it is this unique circumstance of unfolding which constitutes the total difference between the antecedent and the consequent; in all other respects, there is no change, no creation, no destruction, things have remained in the state in which they were."[13] Meyerson clearly portrays the outcome. "Let us suppose for a moment that science can really make the causal postulate prevail; antecedent and consequent, cause and effect, are confused and become indiscernible, simultaneous. And time itself, whose course no longer implies change, is indiscernible, unimaginable, non-existent. It is the confusion of past, present, and future—a universe eternally immutable. The progress of the world is stopped. And, of course, simultaneously, or rather previously, the cause has vanished. For as soon as cause is confused with effect, when there is identity between antecedent and consequent, when nothing happens, there is no more cause."[14]

My contention is that any view which entirely eliminates either the temporal direction of the causal process or the identity between cause and effect does not truly express the empirical fact of causality. It is my problem in the remainder of this paper to show how identity and real temporal passage are united in the causal process. This requires first a brief analysis of time.

II

To my mind, there are two requirements an adequate theory of time must meet. It must furnish an ordering principle of temporal periods, such that of any two (non-simultaneous) periods of time,

[13] *De l'explication dans les sciences* 136.
[14] *Identity and Reality*, tr. by Loewenberg, 230.

one must be before the other and the other after the one. That is, time must have a direction, and this direction must be applicable to every portion of time, no matter how short its duration; otherwise that portion would not be itself temporal. The other requirement is that the theory must give an unambiguous meaning to the present; otherwise the distinction between past, present, and future (which is different from that between before and after) is meaningless.[15] Furthermore, I hold that both of these requirements must be satisfied ontologically, for if either is merely subjectively fulfilled, time itself becomes merely subjective, and I refuse to deny reality to as pervasive and inescapable a feature of experience as is its temporality (so long as no flat logical contradiction has been shown to be hidden in it).[16] Granting an ontological satisfaction of these two requirements, it follows that past, present and future have each a unique, ontological status.[17] Hence I contend that any view which denies all reality to one or more of these temporal categories, or reduces one or two to another or to the third, is fundamentally erroneous.

Thus, for example, I cannot accept C. D. Broad's view of time. "When an event, which was present, becomes past, it does not change or lose any of the relations which it had before; it simply

[15] I am indebted to Professor Arthur Murphy for bringing these two requirements clearly to my attention.

[16] Two attempts to prove the contradictory character of time are the arguments of the absolute idealists (*e.g.*, Bosanquet in *The Meeting of Extremes in Contemporary Philosophy*, especially ch. ix) and of McTaggart (in *The Nature of Existence* II, bk. v, ch. xxxiii). The argument of the former reduces to this. Only the Absolute (as all-inclusive) is completely real. But the Absolute cannot be in time, since it includes all temporal differences. Hence time cannot be completely real. The argument is sound if one accepts the premise: only the Absolute is completely real. I do not.

McTaggart's argument is as follows: Time presupposes the '*A* series' (past, present, and future as constantly changing in regard to the events characterized by each). This means that past, present, and future all characterize every event. Yet they are incompatible determinations. This contradiction is not avoided by claiming that events do not have all these determinations simultaneously, but only in succession, for 'in succession' means in relation to some other events which themselves, successively, possess all three of these determinations, and this leads us into an infinite regress. This argument, it seems to me, proves not that time is self-contradictory, but that it requires a unique designation of the present, such that events will bear a changing temporal relation to that present.

[17] Consider the ordered series of temporal periods *m*, *n*, *o*, whose direction is defined such that letters earlier in the alphabet stand for periods earlier in time. If *n* be uniquely defined as the present, then the direction of the series will unequivocally determine *m* as past and *o* as future.

acquires in addition new relations which it *could* not have before, because the terms to which it now has these relations were then simply non-entities."[18] This view is unacceptable because it gives absolutely no reality to the future. "It will be observed that such a theory as this accepts the reality of the present and the past, but holds that the future is simply nothing at all."[19]

The most obvious criticism of this view is that, if it be correct, *all* judgments concerning the future (even the most general one that there is something future) become meaningless, if not downright false. Broad partially recognizes this. "Thus judgments which profess to be about the future do not refer to any fact, whether positive or negative, at the time when they are made. They are therefore at that time neither true nor false."[20] But he does not see the full implication of his position, for he claims that such judgments become true or false when the (non-existent) future facts to which they supposedly refer do come into existence. But then obviously the judgments must be changed from future to present or past tenses, and it remains *forever* true that *no* judgment about the future can ever be true or false. Broad covers up this untenable result by claiming that judgments concerning the future really are about something. "If then we ask: What are judgments which profess to be about future events really about? the answer would seem to be that they are about some characteristic and about becoming. And if it be asked: What do such judgments assert? the only answer that I can give is that they assert that the sum total of existence will increase through becoming, and that the characteristic in question will characterize some part of what will become."[21] Obviously this is a complete surrender. For Broad clearly means us to accept as *now* true the assertion that the sum total of existence *will* increase, and he implies that the phrase, what *will* become, does *now* refer to something, not to blank nothingness. More subtly, it seems to me he implies that in some cases *what is* becoming (or has become) can be identified with *what* (for a previous judgment) *will* become; otherwise a judgment about the future could never be true—not even *after* the event with which it is concerned has come into existence. But such an identification would be

[18] *Scientific Thought* 66.
[19] *Ibid.* 66.
[20] *Ibid.* 73.
[21] *Ibid.* 77.

nonsense if *what will* become is simply nothing. In short, not even the dialectical legerdemain of one of our most skilled contemporary scholastics can hide the obvious conclusion that if the future has *no* reality, *no* judgment about the future can *ever* be true.

In line with the requirements of a theory of time outlined above, this criticism may be formulated differently. If the future be simply nothing, temporal direction is inapplicable to the relation between a present and a future; the present cannot be before the future, because the future is nothing, and hence cannot come after the present. It is true that Broad's view gives temporal direction to the relation between a past and a present and between a more and a less remote past. But since we have no right to say that the sum total of existence will increase, we cannot attribute any temporal direction to the present relative to the future or between a less and a more remote future. For Broad, any given present could turn out to be literally the last moment of time.[22] Moreover, besides denying all ontological status to the future, his view, although allowing reality to the past, really gives no significantly unique status to the past (as distinguished from the present). "Nothing has happened to the present by becoming past except that fresh slices of existence have been added to the total history of the world."[23] It seems to me that mere addition of content is not sufficient to differentiate past from present, for this feature also differentiates a more from a less remote past, and I contend that the relation between a past and a present is not simply the same as the relation between a more and a less remote past. The present and the past must each have a distinctive, non-interchangeable, ontological status. I should say that in some vital sense it is true that the past has ceased to exist, that Broad is wrong when he says, "There is no such thing as *ceasing* to exist; what has become exists henceforth for ever".[24]

For essentially the same reasons I find myself unable to accept the pragmatic interpretation of time, as developed, for example, by E. A. Burtt and G. H. Mead. This position is not so unambiguously stated as Broad's, but I shall put it in its most extreme and, to me,

[22] And yet such an occurrence could not be discovered until that last present had become past! In fact, Broad has no right to use the equivocal expression, "the sum total of existence is always increasing", except with the definite qualification that this implies nothing concerning the continuation of such a process into the future.

[23] *Ibid.* 66. [24] *Ibid.* 69.

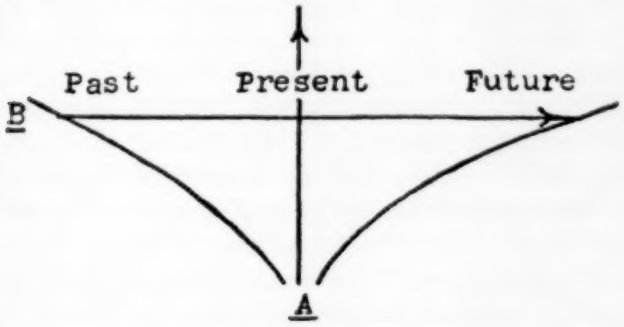
untenable form. It claims that only the present has any reality. Past and future have existence only within a present. We must start from experience. In experience we find only presents; pasts and futures arise out of these presents (and yet remain within them) through the demands of intelligent control of them. E. A. Burtt affirms that "real evolution, that is, evolution as empirically discovered, is not a movement from past through present to future . . . it is evolution from the present into both the past and the future. . . . The world always takes shape from the present outward. It expands into the past as knowledge of the past is needed to satisfy present desires; it expands into the future as grasp of recurrent regularities permits anticipation, prediction, and intelligent purpose. But it remains within the present all the while, in fact it only generates a vastly larger present."[25] Real (versus abstract) time is the evolving present of my experience; a past or future extending outside the present is an abstraction (therefore, on this empirical doctrine, not real). The locus of the real (empirical) past in the present is indicated by the fact that such a past develops with the development of the present. For example, my birth is not a fact in my experience until that experience has considerably evolved.

G. H. Mead, in his *Philosophy of the Present*, has elaborated this doctrine. He asserts that "reality exists in a present. The present of course implies a past and a future, and to these both we deny existence."[26] The past is "that conditioning phase of the passing present which enables us to determine conduct with reference to the future which is also arising in the present."[27] The past and future are both hypothetical, ideational; they are means of interpreting and controlling the present. Thus they both change with the emergence of new presents. Such a view seems more paradoxical when applied to the past than to the future, and Mead consequently spends more labor upon justifying it in the former regard. The past is usually viewed as irrevocable. But on Mead's view it must be, at least to some degree, revocable. There is no simply given past; every past is relative to a specific present, and it changes as new emergents appear. "It is idle, at least for the purposes of experience, to have recourse to a 'real' past within which we are

[25] *Proceedings of the Sixth International Congress of Philosophy* 172.
[26] *Op. cit.* 1. [27] *Ibid.* 28-29.

making constant discoveries; for the past must be set over against a present within which the emergent appears, and the past, which must then be looked at from the standpoint of the emergent, becomes a different past."[28]

Now the basic objection I wish to urge against this pragmatic account of time is that, by making past and future unreal, it cuts away the ground from under its own tacit assumption that there are different presents temporally related to one another. This assumption is quite clearly involved in Burtt's exposition. He insists on the *real evolution* of the individual's present experience. Certain pasts (*e.g.*, my birth) only arise when my present experience has achieved a certain development. Burtt's diagram giving the relations between real and abstract time presents the assumption in question visually.



A is real time, the evolving present of experience. *B* is abstract time. The interesting feature is that, though any given present on the *A* axis can be developed on the *B* axis into both a past and a future, yet *A* itself has length and direction. There are earlier and later presents in *A*. Hence, even though the past and future of *B* be reduced to *A's* present, the past and future of *A* remain irreducible thereto—unless Burtt is willing to deny the real, experiential evolution represented by *A*. This assumption that there are temporally different presents is likewise involved in Mead's formulation. Presents come and go; some are before others; we read of the "passing present" (which I take to be a present present as distinguished from a past present). The doctrines that new presents gen-

[28] *Ibid.* 2.

erate new pasts, and that any real past is a past relative to a specific present, certainly imply different presents temporally related.

The dilemma is obvious. Either the "passing present" is temporally all-inclusive or it is not. Both Burtt and Mead imply that it is not; and if it were, the very non-pragmatic conclusion would follow that there is no passage. But if the passing present can be legitimately distinguished from previous presents, even though the recognition and assertion of that distinction occurred only in the passing present, there must be a real past irreducible to the present.

III

To satisfy the requirements of an adequate theory of time, I must give a unique definition, in ontological terms, of (1) the present and (2) the direction of the temporal series. The present I identify with change. Any change whatever, so long as that change is in process, *i.e.*, is really change, constitutes a present. With the empirical humility of Aristotle, I accept change as an ultimate, undeniable character of reality. Change is always a passage from indefiniteness to definiteness. This is not a definition (for 'passage' would make it circular); it is a characterization. By passage from indefiniteness to definiteness I mean the arising of unique, actual togethernesses of characteristics, in which process the characteristics (as actual and concrete, *versus* as abstract possibilities or the mere indefiniteness of the future), as well as their togetherness, arise. This passage we can call an event. Every event is an event in the history of at least one existent thing or identity. Hence events cannot be ontologically more ultimate than things.

The present thus has spread—it is not a 'knife-edge'. Its spread varies with the concrete changes of the concrete things actually occurring; it is a matter for empirical investigation. Any concrete present can be temporally analysed into earlier and later stages by reference to other concrete changes of other existent things which partially overlap it; but the stages are not themselves presents nor do they change; hence they are not parts of the concrete present though they are relational properties of it. A most important kind of change for human conscious experience is that of the specious present. But it is wrong to take this kind of change as *the one* true present. It is the type of present which peculiarly characterizes

consciousness; other things have their own more or less peculiar types of present. It is in line with common sense to suppose that all presents overlap so that there is a common element in them—the abstract present moment which is the same throughout the universe. Whether this is the case can be determined only by mensurational comparison of spatially different times, which leads into the problem of relativity, whither I am not competent to go.

The present is the passage in the history of any concrete thing from indefiniteness to definiteness. This enables me to give a definition of temporal direction: *m* is before *o* in the history of a concrete thing if there can be found an event, *n*, in the thing's history such that when *n* was[29] present *m* was definite but *o* was indefinite. Thus it is obvious that temporal direction must always tacitly presuppose reference to a present. No past event is before another past event as such, but only relatively to some present, and likewise for future events.

The future is the state of indefiniteness before it has entered the process of becoming definite. I differ here from Broad in holding that this state of indefiniteness is objectively real. In one sense, I do not believe that the future is completely indefinite; we can be sure it will become definite in harmony with the definiteness of identities preceding it. But it really is indefinite; it can become definitely this or that, but it is not as yet this or that. It embraces real alternatives, *i.e.*, possibilities which as actual would be mutually exclusive, what I shall call 'alternatives in actuality'.[30] This view is very similar to Whitehead's (as I understand the latter), but it differs in not breaking the future up into a realm of objectively subsistent possibilities or "eternal objects". Definite possibilities in the future are our abstractions from past definiteness as applied to the in-

[29] The tense here is to be disregarded.

[30] By 'alternatives in actuality' I mean what W. E. Johnson calls determinates under the same determinable (*cf. Logic* I 174 ff.), *i.e.*, characteristics falling within the same class, as for example different colors—so far as they are taken as characterizing precisely the same existent or part of an existent at the same time. Consider a certain patch of paper before me. Its future color is as yet indeterminate. Its past color at different times was, no doubt, different. But if at any designated moment it was white (and not a mixture of colors), then it could not also at that moment be any other color than white. On the other hand, determinates under different determinables do not, as characterizing the same existent, form alternatives in actuality. The patch of paper may be both white and of a certain density, texture, and shape, at the same time.

definiteness of the future. They are legitimate hypotheses as to how the future may become definite; but the future itself is actually indefinite; it is thereby hospitable to all possibilities we can formulate, but we can never exhaust it or even constitute a portion of it by any formulation of possibilities.[21]

The past is the completely determinate. It is that which has become definite, and hence is not any longer open to modification. It is in this sense that the past has ceased to be—it has lost the passage of the present. When an actual togetherness of characteristics has once been achieved, *it* cannot be undone or itself changed. If a past could be transformed, as Burtt and Mead argue, it would not be past, for transformation is change, that is, a present. It is legitimate to assert that a certain past condition might have been different, for before that condition had become definite through the passage of a present there were other possibilities of definiteness besides that which was actually achieved. But the condition as now past can never be other than what it is, though our knowledge of it may change.

> The Moving Finger writes; and, having writ,
> Moves on: nor all your Piety nor Wit
> Shall lure it back to cancel half a Line
> Nor all your Tears wash out a Word of it.

I can see many possible objections to the view of time outlined above. I shall consider one of them which is especially fundamental and may help to elucidate my position. This possible objection is that there are many processes in time exactly the reverse of the passage from indefiniteness to definiteness. For example, energy-distribution in space is passing from a highly differentiated toward a homogeneous condition. I answer: homogeneous distribution in space is as definite or determinate as is heterogeneous distribution. The determinate is that which has achieved an actual togetherness of definite characteristics and has thereby excluded all other possible togethernesses of characteristics. The indefinite is that which does not absolutely exclude any self-consistent possibility. In the

[21] I am not sure concerning the status of Whitehead's "eternal objects". Perhaps I do not differ at all from him on this point. See "Of What Use are Whitehead's Eternal Objects?" *The Journal of Philosophy* XXVII 2, Jan. 16, 1930.

above illustration, when the world has become actually homogeneous, it cannot be at that time actually heterogeneous.

Nevertheless the past does, to some degree, determine the future; if the future were wholly indeterminate, all empirical and predictive knowledge would be dust and ashes. It is obvious that some things preserve, for a time, their identity; they have histories. In short, causality as well as temporality characterizes the real world. I turn to an interpretation of causality which will be in harmony with the view of time delineated above.

IV

First, let me recapitulate a doctrine of identity I have expressed elsewhere.[32] Identity refers to the persistence of a concrete existent or thing. Concrete things possess no substantial or other non-qualitative factor. Their existence refers simply to that unique togetherness of their characteristics (including both qualia and relational properties) which is actually attained in their past, is arising in their present, and is included as a possibility in the indefiniteness of their future. But these characteristics differ in focality or essentiality in the thing. A thing retains its identity so long as modifications occur merely in its unessential characteristics, but as soon as modification enters into its structure of focal features, its identity (*i.e.*, it itself as existent) is destroyed. These focal features are interdependent within the concrete thing; a change in one affects all.

I wish to set it down as an empirical principle that concrete things tend to persist, to retain their identity. This is equivalent to a reiteration that there are identities—a fact I do not pretend to explain. This means, then, that present, existent things tend to make the future definite in conformity with their own past definiteness. This determination of the future by the past occurs only in the present, but it involves a real interplay there of the past and future. That is, every existent thing includes a past and future as well as a present, although its future is still indefinite.

I may state this principle of the persistence of existent things as

[32] See "Continuity and Identity", "Numerical and Qualitative Identity", and "Focalized Identity", in *The Monist* XLII 4, October 1932; XLIII 1, January 1933; and XLIII 2, July 1933.

follows. Existent things fail to persist only when their persistence is prohibited by the persistence of other existent things. Nothing is destroyed by mere old age or the recalcitrance of the future. Not the future, but other existent things tending to determine the future in conformity with their own determinateness, endanger the identity of any particular existent. Not mere time, but bacteria, cancers, machines, kill men. Not age, but hurricanes, earthquakes, bombs, destroy buildings. Furthermore, it seems to be an empirical fact that no existent has been destroyed whose destruction has not left a number of existent parts, which are themselves wholes including parts.[23] In any case, no existent has been ontologically broken up into mere characteristics; the destruction of any unique togetherness of characteristics, arising in the process of passage to definiteness, gives rise to new togethernesses, not to separately existing characteristics.

The combination of the principle of the persistence of existents with conflict between existents in their persistence makes it possible to claim both that the future is determined by the past and that it is not wholly determined by the past. After a certain future has become past, we can always find specific identities determining it; and while it is still future, we can say that *some* previously existent identities will play a rôle in determining it. But just *what* identities will persist into, and thus determine, a future cannot be known with *certainty* beforehand, though by empirical methods we can gain probable knowledge in this regard. The impossibility of gaining certain knowledge concerning the concrete nature of the future rests upon the ontological indeterminateness of the future—it really *may* be determined in conformity with *any* previously existent thing, and *what* things will be successful is, in part, not

[23] I distinguish parts from characteristics in that a part is itself an existent, and thus, through the unique togetherness of its content, is not predicable of anything else. A part is, however, an existent wholly included in another existent, which latter is called the whole of which the former is a part. The fact that the whole does include such and such a part is a characteristic of the whole (a relational property), but this does not require us to hold that the part is itself a characteristic of the whole. Some parts of an existent thing may be destroyed without destroying the thing's identity, others may not; those which may not are such that the relational property of possessing them is a focal feature of the whole thing. A part which is thus essential to a whole has its own focal features all of which as a totality are embraced within, but do not exhaust, the focal features of the including existent.

decided until, and precisely in, that present in which the future passes into determinateness.

It is necessary to elucidate further the principle of the conflict between existents to determine the future. This conflict occurs only in an overlapping portion of the presents of the existents concerned. Furthermore, it occurs only when, in the overlapping portion of two or more existents, the possibilities of definiteness in conformity with the different existents are actually incompatible—some of these possibilities are alternatives in actuality. Two identities conflict when, in a common portion of their respective presents, passage into definiteness in conformity with one would issue in a characteristic which is an alternative in actuality to a characteristic in conformity with the other. This requires that the two identities have at least one part in common, since alternatives in actuality are defined relatively to a common existent. Take the burning of a piece of coal. The fire is, while it lasts, as truly an existent thing as is the coal. A part in common between these existents is the carbon. As examples of alternatives in actuality, consider the different temperatures and colors of the carbon in combustion as distinguished from the carbon in its unburnt state in the coal. And whoever has tried to start a furnace-fire on a cold morning with little kindling knows I am correct in saying that whether the coal or the fire will make the future definite in conformity with itself is undetermined until that future has itself become determinate (*i.e.*, past).

Causality is simply change so far as determined by some concrete identity or existent thing. Every change is causal if taken in relation to the proper identity, for every change is a passage into definiteness in conformity with some identity. But this is not absolute determinism, because, in the conflict for persistence which occurs between existents, the outcome is always to some degree objectively uncertain until the passage has been completed and the event past. The past is wholly determinate, and, in the sense that all of its definiteness was determined by previously existent things, the past is wholly determined. But it is still true that anything in history *might* have been different, for some identities actually defeated and destroyed might have been successful in the process of determination. That the future will become determinate and in that

process be determined by the determinateness of previously existing identities is a principle of which we can be sure. But just what identities will thus persist is always a legitimate source of uncertainty.

I have thus given ontological significance to both those factors in causality which we saw were required by it: temporal passage, involving a temporal direction in the relation between cause and effect, and relevance, involving an identity between cause and effect. Time is real—future indefiniteness passes into definiteness. But this process is determined—identities tend to persist until destroyed by the persistence of other identities.

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CAUSATION AND COGNITION[1]

IF I were to ask the members of this conference the naïve question, which is the most significant of the bodily senses, by much the larger number would undoubtedly reply the sense of sight. The phenomena of light and color are so various, so beautiful and so immediate that it is really not possible for the perceiving mind to doubt their existence in the universe outside us even if there were no mind to perceive them. Indeed, for most of us the physical universe, that is the universe outside us, usually means the visible universe; and this method of visual thinking is not wholly the result of mental habit. It also has a clear warrant in the nature of the physical universe itself; or, to come at once to the point, the phenomena of light and color are so manifold that it is much easier to particularize physical objects by their shades, tints and colored shapes and sizes than by any other sensible qualities.

The phenomena of light and color also have a constancy about them which we often overlook. Grass is green, the sky is blue, all swans are white, or, if upon occasion these propositions be not true, we know the reason why—or at least we know that there is a reason why—and when we can explain the exceptions to any proposition, the proposition necessarily takes on additional and not less validity. I saw the Mountain today and I saw it yesterday and I have seen it almost every morning and evening now for many years, and, having no shadow of evidence for coming to any other conclusion, I assume that it has existed in the interim. And when I use the term 'mountain', I do not mean an invisible metaphysical mountain, like a mountain which is always behind my back, but the visible familiar mountain, green with foliage in summer, tinted with scarlet and gold in autumn and white in its winding sheet of snow when winter comes. The theory, which has existed almost unchallenged since Locke wrote Book II, Chapter viii, of *The Essay on Human Understanding*, that lights and colors are subjective emanations of a mind's sensitive retina, clearly stands in need of some careful revision. This whole theory, as we know, rests upon the obscure phenomenon of inadequate or artificial stimulation, a phenomenon

[1] A paper read before the Philosophical Association of Toronto, Queen's and McGill Universities meeting at McGill on March 25 to 26, 1932.

which, as Berkeley pointed out long ago, applies with equal force to all forms of perception. It is indeed a perplexing philosophy, is it not, which would base its theory of knowledge upon the data of sense-perception and at the same time proceed to put in doubt the most obvious revelations of the senses? In any case, if we assume with Locke that lights and colors are purely subjective, we must at least be prepared to offer some reasonable explanation of the universal misperception that they are in fact qualities of real objects existing without the mind.

Some few of us, however—the musicians and some mystics for example—may think that the sense of sound has some claims to first place in this competition. The phenomena of light and color are so obvious that we take them for granted, but what shall we say of those transient, vagrant, mystic happenings called tones and noises? That tones have the attributes or ingredients of quality or pitch, intensity or loudness and duration, and noises the ingredients of loudness and duration, seems obvious enough; but have they also the attribute of extension? Have sounds volume? Is the roar of a lion really any bigger than the cheep of a cricket, or is this seeming difference only the result of synesthesia and loose association? This question, simple as it appears at first, is really of very great importance. The human mind, for example, seems to have little difficulty in forming the concept of timeless space; the existence of Euclidian geometry is proof enough of that. But can our minds with equal facility form the concept of spaceless time? Are there, in other words, any such things as pure events? Are there any events within our mental reach which happen wholly in time, *quanta,* intensities, mental processes, values, logical relations, images for instance? I am, at this moment, for example, about to form the image of a golden mountain: indeed I am compelled to do so if I am to put any intelligent construction upon the philosophy of David Hume. Wherein, then, does this image exist? It clearly does not exist in space! Is there, then, any room in time? Can events co-exist in time and not be *external to one another in space,* and, if so, how shall we conceive of time? Shall we conceive of it as time becoming, that is time ceasing to be and beginning to be at every passing moment world without end, or shall we conceive of it as universal time, that is time everywhere, past, present and future?

Time is clearly the most universal attribute of things. Everything that is in space is in time. Time is just as outer as space. The time-sense is just as much an outer as an inner sense. Does time really pass, then, or is this only another of those vexatious spatial metaphors? Clearly time does not move. Motion is a change of position in space. Perhaps, therefore, instead of speaking of a four-dimensional space-time continuum we should speak simply of four-dimensional time, or is that also a spatial metaphor?

Then again there is the exceedingly interesting phenomenon of tone-fusion when the component tones, whilst remaining audibly distinct, nevertheless unite into a single clang with a novel timbre all its own. What, then, is the difference between composition and addition? Does composition of qualities, of tones, for example, take place in time and not in space and are all purely qualitative changes in the universe, therefore, essentially spaceless? Clearly pure qualities cannot be added to one another. There is no such thing as a sum of qualities. Open Browning. Perhaps the poet has something to say on this theme. Read *Abt Vogler* again, especially the following lines which I think contain the boldest venture in metaphysics in the whole anthology of English verse:

> But here is the finger of God, a flash of the will that can,
> Existent behind all laws, that made them and lo, they are!
> And I know not if, save in this, such gift be allowed to man,
> That out of three sounds he frame, not a fourth sound, but a star.

A new star is created in the firmament of sound. Is this, then, the principle of creativity that we have been searching for so long?

There is a passage similar to this from Browning by the admirable Lotze in *Metaphysic* I, vii, and near the beginning of the chapter, where Lotze, after criticizing the visual theory of a universe envisaged as a vast network of relations, concludes as follows—

> If then a sensible image is needed to help us to apprehend the universe, we should not think of a widespread network of relations, in the meshes of which things lie scattered, so that tightening of the threads, now at this point, now at that, may draw them together and force them to share each other's states. We should rather recall the many simultaneous 'Parts' of a piece of polyphonic music which without being in space are external to each other in so far as they are distinguished by their pitch and tone, and of which first one and then the other, now rising or falling, now swelling or dying away, compels all the rest to vary correspondingly in harmony with itself and

with one another, forming a series of movements that result in the unity of a melody which is consistent and complete in itself.

Do we then come nearer the reality of things through the sense of sound than through the sense of sight? Browning seems to think so, for he adds later on in *Abt Vogler*—

> But God has a few of us whom He whispers in the ear;
> The rest may reason and welcome: 'tis we musicians know.

The argument seems distinctly suggestive and revolutionary. The universe is a universe of events or happenings like sounds and not of static visible or tangible objects, and this new perspective changes the whole problem. The question, for example, from what matter or stuff events are made has now no meaning. The problem of the ultimate nature of being also has no meaning; there is no ultimate being. Space, too, can have no shape or fixed magnitude; it is only an abstraction from time and abstractions have no shape or magnitude. The old question whether space be finite or infinite is also meaningless and the universe, therefore, can no longer be envisaged as an object in space like the mountain or the moon or the galactic system. That is quite too crude a *Weltanschauung*. A Euclidian universe is at best a dogmatic abstraction. The universe, in other words, is not a closed, fixed, finished universe but an open, transient, unfinished universe. A fringe of unreality as inscrutable as reality itself hangs over all things. The existential must give way to the problematical. There are things that might have been and never were; things that ought to be and cannot be; things that may or may not be both now and in the future. Πάντα ῥεῖ. οὐδὲν μένει. No man dips his toes twice into the same stream. Everything is constantly becoming its opposite. Everything is and is not. Nothing is absolute. All is relative. Heraclitus, Hegel and Einstein shall be our Trinity. What a whirligig of a universe this universe of events really is!

No one, I imagine, would care to enter the sense of taste or smell in this competition. These are usually regarded as minor senses. Although there are about thirty elementary smells they have so little meaning that we do not even take the trouble to give them names and very few of us are really aware, until it is pointed out to us, that there are only four simple tastes, *viz.*, sour, sweet, bitter

and salt. If, however, we care to call to mind the very important part which these two alimentary senses really play in the maintenance and enjoyment of life, we may be inclined to revise this first hasty decision. Indeed, we have scarcely crossed the threshold of our inquiry until we discover that there are apparently two groups of senses, an epistemological and a biological, the epistemological being mainly interested in the perception of things and the biological in the maintenance and enjoyment of the sensitive bodily organism. I do not, now, wish, however, to dwell upon this important distinction, although it easily suggests some of the most persistent problems in the history of philosophy, and I admit that until these two functions of sense-experience, the epistemological and the biological, be carefully distinguished, there is no great hope of a really scientific epistemology. Is there, then, any ingredient of ultimate knowledge in our consciousness of things or is all consciousness purely biological? Is all consciousness, in other words, wholly adaptational? Do we really know things by becoming conscious of them or is consciousness only an organic or emotional effect of cognition and, if so, how shall we account for cognition at all?

As a matter of fact all the answers I have suggested to the first question in this paper are incorrect. The most important and significant of the bodily senses is not the eye, the ear, the olfactory lobes or the papillae of the tongue. For psychophysics and, therefore, I suggest for epistemology, the most important and significant of the senses is that layer or really several layers of integumentary tissue which cover the outer surface of the body and are called the skin.

In the first place, may I point out that the skin is perhaps the best criterion we have by which to distinguish between organic and inorganic bodies. Organic or living bodies have skins; inorganic or dead bodies have no skins. The cells of the inner layers of the skin are living and the cells of the outer or epidermal layer are dead or dying. All the issues of life lie hidden here. The progress of a single sensitive cell from the inner to the outer layers of the skin probably contains *in epitome* the whole history of known life and sensitivity in the universe. Strange things go on under this outermost wrappage and counterpane of the human body! If we only knew, therefore, when and how and why living bodies first be-

came sensitive and, becoming sensitive, became aware of a world around them, we should probably be able to answer all the fundamental problems of epistemology. The sensitive skin is, I think, therefore, a subject worthy of more minute and careful study.

The skin is a sensory mosaic in four modes, *viz.* pressure, warmth, cold and pain. This classification is neither exact nor complete but the main facts are sufficient for our present purpose. I do not wish, however, to discuss all of these cutaneous modes save, perhaps, to point out *en passant* that pressure is probably the most objective and pain clearly the most subjective of all sensory modes, whilst the temperature-senses, warmth and cold, are really neither wholly objective nor wholly subjective. Warmth and cold, like taste and smell, in other words, are mainly adaptational senses. We do not sense temperature in itself, whatever that may be, but only changes in temperature at or near the periphery. With these senses as with many others the meanings of sense-data are not always specific objects or things. They are often purely relational and functional. We all know how deleterious rapid changes in temperature are to the sensitive bodily organism; hence these two complementary temperature-senses, warmth and cold. It is the sense of pressure, however, which interests us most at present; let us, therefore, turn to that subject.

If my finger-tip, then, or any part of my sensitive skin, come in contact with a physical entity X, an event or process happens in two components or ingredients. There is, first, the objective component, the object of sense-awareness, which we name later on physical reality or matter. The question what the ultimate primordial, pristine nature or constitution of matter really is—the question, in other words, what matter really would be if there were no mind present to perceive it—need not perturb us at present. Why assume so soon that an event has not happened when it has happened? Why turn off the light to see what the universe would look like in limbo? The metaphysical search for an ultimate unknowable reality which is more real than the real we know is both illogical and futile. The epistemologist is not haunted, however, by this metaphysical illusion. He would look at the universe about him with both eyes unflinchingly. He proceeds upon the postulate that all knowable causal ingressions must fall within the ambit of

cognition and are, therefore, knowable realities. Whether, therefore, the ultimate nature of matter be solid stuff, or electromagnetic energy, or a knot in space-time, or a cosmic will, is a question which we may safely leave at present to the metaphysicians and to the metaphysicists. The practice, furthermore, quite recently adopted by the physicists, of transferring the properties of matter to energy and from energy to space and from space to time does not help us. Why persist in thinking the synthetic in this regressive, analytic way? The method of regressive abstraction leaves no residuum to constitute the world we really know or can know. The analytic judgment, in other words, is purely methodological and nothing is really resolved into its elements or parts by analytic thinking. We are interested at present in the familiar world in all its synthetic fullness. We are interested, that is to say, in the immediate and not in the metaphysical, and least of all in metaphysical negations. All I know by the sense of pressure is that something stands in my way. There are real presences about in the existence of which I am compelled to believe whether I will or no and with which I must reckon for good or ill.

Then, secondly, there is the subjective component—the sense of pressure itself. This component is purely personal. If I did not exist it could not exist and it may even continue to exist as an after-image after the object has ceased to exist. Now, I may repeat this most primitive of all scientific experiments as often as I wish and check it over by simple repetition or by memory or by any form of reasoning and the results become increasingly clearer. The belief in the existence of an independent real world which is not me becomes more and more pronounced as I proceed. Such, then, is consciousness or being-aware in its simplest form. Consciousness is always an explicit awareness of other things and an implicit awareness of self. But the awareness of other things is always primary. Even the subjectivist error, which conceives the data of consciousness after the analogy of physical things and, therefore, cuts off all possibility of cognition, is proof enough of this. In other words, the problem of self-consciousness is really only minor, since it is at least probable that if consciousness can be aware of other things it can be self-aware. Indeed it is just this awareness of consciousness, this immanent, vagrant, boundless being-con-

scious which is the only self we know or can know. Make the universe as vast as we will, we are only paying an implicit compliment to the conscious mind which can say, Oh! Universe. The data of consciousness are not self-subsisting entities in themselves and any attempt to construe mental processes after the analogy of physical things in space is, probably, the most naïve of all philosophical errors. At any rate the ancient scholastic theory which envisaged the conscious soul or self after the analogy of a physical entity, an atom or a proton, for example, and the corresponding epistemological presupposition which always conceives the object to be a fixed entity there-then and the subject a fixed entity here-now, have long since proven wholly comfortless and futile. Indeed these theories really only succeeded in denying the things they set out to prove. Consciousness is an unruly member and stubbornly refuses to be put in place in this way. The theory that an infinite universe could reveal itself to a speck of itself in unthinkable.

Let us now vary this simple scientific experiment slightly and bring my finger-tip into contact not with a physical object X but with that peculiarly concrete, intimate weight of body and limb, my own body, and this time a process occurs compounded of two awarenesses, one at the finger-tip and the other at the point of contact on the periphery of the body. Now it is clearly by this double sense that I first discover the uniqueness of my own bodily organism and, therefore, also discover that most disturbing of all Trinities, my mind, my body and the universe about me. I do not now wish, however, to dwell upon the significance of this primitive discovery at length. I have frankly confessed that I cannot explain when and how and why organic bodies first became sensitive. Indeed, it is probable, perhaps certain, that no possible system of scientific concepts can ever cover the fullness of this phenomenon. Some helpful suggestions, however, follow the results of this experiment.

This experiment explains, for example, the fact that all sensations, as they occur, appear always as felt bodily processes. Sensations, in other words, can never occur outside the body in space. The only *nexus* between the physical stimulus, near or remote, and its corresponding mental process is through their mutual bodily correlate. Is there then, we may ask, again, any appreciable sense

or truth in calling lights and colors and tones and noises sensations? Has this question really any meaning and if not why rob the familiar physical universe of all its qualitative ingredients in this meaningless way? Why proceed along a path which only succeeds in making all explanation increasingly difficult and finally ends in a blind alley? If the chain of psychophysical causation only leads to limbo, there must be something fundamentally wrong with our theory of causation. If the physical universe, for example, is really a space-time bubble, how shall we account for the amazing misperception called the familiar external universe?

Certainly there never was a time when Des Cartes' distinction between extended substance and thinking substance, carried forward by Locke into his chapter on the Primary and Secondary Qualities, rested upon so infirm a foundation as at present. We now know, for example, by scientific proof that matter is not the dead, inert, indestructible, extended substance which Des Cartes, Locke and the materialists believed it to be. We are also beginning to recognize that space and time are not mere empty nothingnesses. Matter without space, time, energy and motion is helpless, and blind energy never could have designed the physical universe and set each planet and proton in its place. Mathematical physicists, terrestial and celestial, are everyday discovering new immaterial presences at every point of space and in every particle of matter. The physical universe, in other words, has walked right up to the door of mind; and matter and mind have become much more intimate than hitherto. To which world, then, do lights and colors and tones and noises really belong? Are they the last effects in a chain of psychophysical causes or are they real objects of perception? Physics does not seem to help us much to solve this problem. Obviously I do not see ether or space-waves; I do not hear air-waves. I see lights and colors and hear tones and noises. May not, then, the familiar world after all be the ultimately real world?

This experiment in double-pressure sensation also provides the basis or criterion by which we attribute psychic or mental properties to some classes of physical bodies and not to others. I attribute psychic properties, in other words, to all physical bodies which behave in a manner similar to the manner in which my own body behaves under similar circumstances. When I pass along the street,

for example, and see a number of physical bodies like my body going to and fro in space-time, pushing forward at every green light, stopping at every red light and behaving generally with circumspection and prevision, I naturally attribute to these physical bodies the usual psychic properties which I myself possess and so on with all the animals each according to its usual forms of behavior. On the other hand, however, and contrariwise, I do not and cannot in any intelligible sense attribute psychic properties to plants although I know that their physical and chemical composition and their metabolisms are almost identical with those of my own bodily organism. Plants, in other words, do not show any sufficient evidences of psychic sensitivity. Of the misnamed sensitivities of inorganic bodies, the sensitivity of a delicate mechanical balance, for example, I shall say nothing here. Some respect must be paid to differences in fact and to the accurate use of scientific concepts. We are now discussing the phenomena of psychic sensitivity. I am well aware, too, that the boundary-lines between the physical and the psychical are never quite accurately drawn, but I am not interested in unlocated boundary-lines. I am interested in the landscapes.

Lastly, this experiment in double cutaneous awareness provides some help towards the solution of the disturbing problem of inadequate stimulation and all that welter of after-images, misperceptions, mistaken synesthesias, illusions, delusions, dreams and manias, which follows in the wake of inadequate stimulation. The sensitive bodily organism may be artificially and abnormally stimulated. This is admitted. The retina may be stimulated by pressure on the eyeball, the basilar membrane by a blow on the head and the whole periphery is acutely sensitive in all its modes to electromagnetic stimulation. The internal metabolisms of the body, too, especially those in the nerves and brain-centres, may also act as stimuli which in abnormal cases produce dreams, deliriums and manias which take on all the similitude of reality. "Dreams are true while they last." Granted! But the conclusion "and do we not live in dreams?" does not follow. Apparently all organic bodies when they became sensitive and psychic, whilst taking on added fullness of life, also assumed some very serious risks of being misled along the way. All human knowledge, however, is admit-

tedly a strange mixture of true and false ingredients. There is no disputing that fact. If it were not so there would be no problems of any kind. Our task, however, is to separate the true from the false ingredients. The task may be arduous and long but science has no other task. All knowledge is a voyage of discovery, but we must carry chart and compass and log-book with us knowing well that each new entry means fuller knowledge. We must not, too, overlook the regulative maxim which I stated early in this paper, that when the exceptions to a principle are explained, the principle itself takes on additional and not less validity. The discovery of the slightest falsehood always adds something to the sum of true knowledge. Science is only another name for the best knowledge, and science never really discards the old as untrue. It only revises the old, moving always from hypothesis to hypothesis and finding at each step a firmer and truer basis of belief. Confounding verbal and formal inexactitudes with epistemological misperceptions is too naïve a logical error to be allowed to pass unchallenged. Indeed these same phenomena of misperception and illusion when properly understood only serve to prove how powerful and unconditioned is the search for truth. Science demands perfect truth and will be satisfied with nothing less. It must clear away all falsehood; it must unmask all illusion; that is the sole aim of all science and of all true knowledge. Art, too, always struggling poignantly in tone and tint and line, will be satisfied with nothing short of perfect beauty, done at a stroke. What, then, if the ultimate primordial nature of the universe be none other than the ideal becoming real, the imperfect becoming perfect, the real confronted by the ideal in a being-becoming world? Let us try, however, to make a little further progress in our present limited voyage of discovery.

Thus far we have only been discussing the pressure-awareness of things at rest and we have not said anything about the awareness of things in motion. Here again, too, I do not intend to go into the psychological minutiae of the subject. There are, undoubtedly, however, some evidences of a special cutaneous sense of motion. Perhaps, indeed, this sense of motion may be the most primordial of all the sense-awarenesses. The awareness of things in motion, for example, is much more acute than the awareness of things at rest. Things in motion are more dangerous to life than things at

rest and the argument from evolution, therefore, seems suggestive. Even physics has its say, for the idea of inertia can be derived from the idea of motion but the idea of motion cannot be derived from that of inertia. At any rate the *terminus-a-quo—terminus-ad-quem* theory of motion, the theory in which Zeno became entangled, is wholly untenable, for how shall we judge that an object has moved from the point *a* to the point *b* unless we take the awareness of motion for granted? Whence comes the predicate to this proposition? I may perhaps add, however, *en passant*, that the relativity of motion has clearly no bearing upon this problem. Indeed the relativity of motion has nothing whatever to do with epistemology. Bodies do not move or appear to move relative to me; they move or appear to move relative to my physical body or to any other point of space which I wish to fix. The data of consciousness can never form a system of reference for mathematical physics. That proposition, I should think, is obvious. I must confess, therefore, that the current confounding of subjectivism with the theory of relativity seems to me to be wholly the result of muddled thinking.

Whatever we may think, however, about a special sense of motion, it is clear that this sensation can never stand alone. Pure motion is unthinkable. There is always something which moves. A space-time synthesis may be sufficient for mathematics but it is not sufficient for physics. Physics demands a mass-space-time synthesis upon which to build its edifice. It is no doubt quite true that the relative quantities of the three ingredients in this synthesis may be grossly mismeasured by the naked eye and by the naked skin. The quantity of mass may be much overestimated and the incommensurable time-coördinate may lead to some inexactitudes since measurement is a process which itself takes time. But these are just the physicist's problems. In like manner, too, the idea of pure becoming is unthinkable and metaphysics must, therefore, have at least a foundation of being-becoming upon which to build its edifice of speculation. Pure becoming is unthinkable existentially.

Let us set aside argument, however, and return to the simple experiment in haptics which we have made the basis of this paper. This time, instead of bringing the sensitive skin in contact with a

physical object X, reverse the experiment and move the point of a physical object X steadily across the skin and, this done, the awareness of motion raises its head above the limen with a clearness and distinctness of definition which is very unusual. This is the perception or sense of motion in its simplest form. A little further experiment and observation, moreover, discloses at least four important and significant truths about motion. These truths are the following: (1) Motion is a composition of two ingredients, *viz.* distance and duration. $V = \frac{D}{T}$. The space-time continuum is this time a psychophysical and epistemological fact. (2) Motion is a continuous series of there-thens terminating in a here-or-there-now, and the 'here' is anywhere near at hand for practical purposes and the centre of gravity of the bodily organism for scientific purposes. (3) The time-ingredient is constant (*a*) for the moving object, (*b*) for the point of reference, which may be any space-point, and (*c*) for the observer. (4) Motion may be in any direction in three coördinates but only in one direction in the primary coördinate that is the incommensurable, indeterminate time-coördinate. Now any distance in any direction is just space, and so we are left with space in three planes and with time the inscrutable. I suggest to you now that this is really the way in which we do perceive space and time. Our experiment, therefore, has now discovered these four, *viz.* matter, motion, space and time, the four primary structural ingredients in the physical universe.

Let me now sum up our conclusions thus far both explicit and implicit and by so doing set down briefly the evidential foundations of philosophic realism as I see them.

1. The testimony of the senses. All sense-experience is essentially intuitional. The data of consciousness cannot stand alone. All mental *data* are mental processes and their stuff at most the mere transient shadow of stuff. The essence of every mental process is its meaning. Mental processes are meant to mean; they have no other *raison d'être*. It seems axiomatic, on the one hand, that we can only know things by becoming conscious of them, and, on the other, that no real knowledge is possible if we allow the *data* of consciousness to intrude themselves between the conscious mind

and its object; and I may add that there does not seem to me to be any possible escape from this dilemma unless we admit the intuitional function of consciousness *a priori*.

2. The testimony of memory. I saw the mountain yesterday and I saw it today, and, having no shadow of reason for coming to any other conclusion, I assume that it has existed in the interim. The weight of this testimony seems to me to be almost overwhelming since it touches the very foundations of all evidence.

3. The contrast between sensation and imagination and, therefore, the contrast between perceptual facts on the one hand and the fictions or quasi-fictions of productive imagination or fancy on the other. This is really the foundation upon which Berkeley built his whole theory of spiritual realism.[2]

4. The cooperation of the senses, experimentation, conceptual analysis and all those forms of reasoning illustrative and symbolical by which we try to eliminate the subjective component in cognition so that the independent reality of things may stand out in clearer and clearer definition. The whole purpose and aim of cognition is to know the real untouched by any element of subjective illusion.

5. The testimony of language, that is the written, oral and acted communications of men with men and of all sentient beings with one another in order that taken together we may arrive at a consensus of opinion for all thinking minds both human and animal. Universality of belief for all thinking beings may not be wholly probative but it is at least evidentiary.

Does this way of thinking, we may now ask, offer any universal law or formula by which this being-becoming world does really behave, that is, does really become? The answer to this question is, I think, in the affirmative and I venture to suggest that this law may be called the law of composite or synthetic evolution or, if you wish to use Kant's terminology, the law of the objective *a priori* synthetic judgment. The aim of all knowledge and of all scientific method is to discover the real synthetic structure and design of the universe around us. Knowledge is never satisfied with the merely structural elements of reality and the search for an ulti-

[2] See sections 28-33 of *The Principles of Human Knowledge*.

mate element leads nowhere. There is much point in Hegel's maxim: "pure being equals not-being". The meaning of the analytic judgment is always to be found in its synthetic implications. The purpose of all thinking, whether synthetic or analytic, is to discover the real composition of its object. There are, too, we already know, abundant evidences of this law of synthesis in all the sciences. For purposes of illustration, therefore, let us glance at a few of them.

The mathematical expression $1 + 1 = 2$ is really true only in an abstract collective sense. The expression to the left of the sign represents two ones and the expression to the right, one two. But this is a very important difference. The grouping is different. All counting in other words is a progressive expanding *a priori* synthetic judgment and counting is just a being-aware of the law of number-groups in the nature of things.

The principle of the parallelogram of forces taken from the science of physics also illustrates this law of synthetic evolution. The component forces whether they be two or infinite in number become ingredient in the resultant but the resultant has a new direction and a new momentum. The components have not only converged, they have become the resultant.

Any example of the principle of multiple proportions taken from the science of chemistry will also illustrate this law. If, for example, two parts of hydrogen and one part of oxygen, both inflammable gases, be united in chemical composition, the result is water, a liquid used to extinguish fire. So far the evidence in this case seems wholly empirical, but if we analyse the water and find, as we always do, that the hydrogen and the oxygen are recovered again, in their original proportions, or nearly so, the synthetic law seems proven almost beyond any reasonable doubt. Hydrogen and oxygen have become water. The plus-qualities resulting from the synthesis in this illustration may be startling, but nature always answers the question put to her by correct experiment with unerring emphasis.

When we come to the science of biology, we are admittedly on more uncertain ground. It is certain, however, that life, as we experience it and as we believe it to exist in all organic bodies, depends upon a synthesis or composition of mathematical, physical and chemical conditions, and it is highly probable, therefore, that these conditions become ingredient in life itself. Indeed it is just

this creative ingression which we call life. The controversy between the mechanists and the vitalists has, I think, become distinctly threadbare, but there is really no solution to this controversy among biologists except by admitting the law of composite evolution. All composition is creative. The composite thing is always the sum of its elements *plus* and the plus quantity-quality is the essence, or as Locke would call it the 'substance', of the thing itself. All substances are particular; there is no fixed determinate common-denominator to all things in general. If there were any such common-denominator the universe could be neither creative nor creatable. It would be, in other words, a dead world in which nothing corresponding to what we call life or mind could possibly exist.

It is when we come to epistemology, however, that we find the most far-reaching illustration of this law. All knowledge is composite and may even at times of self-reflection become acutely self-consciously composite. Every moment of conscious experience changes the whole *ensemble* and complexion of the field of consciousness and of consciousness itself. It is literally true that we are never the same at any two successive moments of our conscious life. All experience is essentially a progressive synthetic unity. Every sensation, every sentiment, every image, every thought leaves its mark upon our conscious life. Fate always follows hard upon the heels of freedom for all conscious beings. The synthetic predicate is the last word in epistemology.

Finally, may I ask a last question: Does this philosophy of being-becoming offer any suggestion towards the solution of the final problem in all philosophy, that is the problem of the ultimate nature of the universe? If the law of composite evolution be the ultimate law of becoming, what is the ultimate nature of being? The answer to this question is also, I think, in the affirmative although of necessity in a very tentative affirmative. Pure metaphysics may, perhaps, get along without a spiritual principle in nature, but epistemology can really make no headway at all without this assumption. Pure metaphysics, in other words, may be content with a universe of being-becoming but epistemology must take account of the facts of cognition and therefore of all that immanence of revelation which cognition always implies. How then is it possible

for any real universe to reveal itself to conscious minds? How, for example, is it possible for the physical universe to seek out the nature and whereabouts of my mind and reveal itself to me? Clearly a dead unthinking material universe cannot rise from the grave and appear to me as it stands before me now. Obviously, therefore, the physical universe cannot be as alien as it seems. This is, I think, the great principle implied in Berkeley's spiritual realism which must always allow him a high place in our philosophic temple of honor.

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RELATIONAL CATEGORIES AND THE QUEST FOR UNITY

THE quest for unity has been a leading motive in philosophical investigation. The desire for unity is the philosophical counterpart to the aim for control over the environment. It gave rise and direction to the development of science, which is the practical answer to this need. Simplicity of formulation and fertility of results has been the ideal of science. The achievements of the mathematical and natural sciences in the beginning of the modern era led to the view that nature could be readily interpreted as a unified mathematical or deductive structure, showing how simplicity in science may lead to oversimplicity in philosophy. What was attempted in the spirit of science in the period of rationalism was repeated in the non-scientific setting of spiritualism by the German idealists, as illustrated by Kant's theory of the categories and the philosophy of Schelling, whose extravagant attempt to deduce all knowledge from one principle remains an extreme example of naïve and speculative monism. Schelling could not render his view plausible without the assumption that an object is thinkable (and hence possible) only in relation to a subject, a relation which turned out to be one of identity. This led him to set up the idea that nature is "becoming intelligence", and to attempt the deduction of the objective world out of intelligence. If a single metaphysical assumption affords a short cut to a theory of unity, Schelling has shown how short that may be.

Kant's table of twelve categories, artificially derived from the traditional logic of grammar, could only confer unity upon the world of experience with the aid of an absolute self or subject. Numerous attempts were made to improve upon the Kantian list of categories by either decreasing or increasing it, a movement which culminated but did not end with the comprehensive analysis of categories by Von Hartmann, who defined a category as "an unconscious intellectual function which posits a definite relationship". His list of categories included such concepts as quality, intensity, space, time, lawful occurrence, purposive activity, thing and property, quantitative determination, order, etc., and his plan had the advantage of making the basic category of relation the

form common to all categories. It is true that thinking consists of relating acts, of syntheses. But no inspection of the nature of thinking can determine in advance what the structure of the world of related objects must be. Such procedure can be no more fruitful than the Kantian, because of the subjective point of departure. The categories were intended to define the necessary conditions of experience. If the knower is regarded as a part of the world of experience, the real problem is to determine the fundamental laws which govern existence in its various aspects. The first step must be the recognition of the irrelevance of actual judgment, together with the elimination of the misleading assumption of a self, whether great or small, absolute or individual. The attempt to begin with actual thought or with a subject for a theory of reality is like the proverbial entrance to the lion's den—all footprints point inwards. No philosophical system has ever recovered from the effects of a subjective basis, if there has been any escape from it at all. Philosophers should never lose sight of the inescapable fact that cognition is a part of the world. Recognizing the priority of the objective world, the aim of philosophy should be the determination of possible relational forms or patterns which have meaning or application in experience. From this point of view there can be no final solution of the metaphysical problem; on the contrary, it must always be open in some respects. If there can be no inductive proof of the 'conservation of order' in the world of facts, neither can such a principle be proved in the realm of mind. The subjective approach possesses no logical advantages over the objective, and is exposed to special dangers that are peculiar to itself.

The subject-predicate logic and the so-called 'laws of thought', to which the principle of sufficient reason is sometimes added, constitute the logical instrument of most traditional thinkers in their rationalistic enterprise, and it is clearly not commensurate with the goal that is set up. It is true that the adoption of an empirical approach to metaphysics makes impossible the establishment of general principles and the attainment of unity. There is no necessity to choose between the traditional deductive and inductive logic. The real choice must be made between the traditional and modern types of deductive logic, and the method chosen must be justified

in the last analysis by induction. Russell has pointed out the limitations of the subject-predicate logic, and the abuses to which it has been put in the interests of a preconceived or predetermined metaphysical principle.[1] The doctrine that every proposition consists of a subject and predicate leads readily to the view that there is one great subject, or the absolute. The traditional logic is most inadequate in its account of relations, as is shown by its failure to analyse serial order and therewith to make application to space and time, and it thus restricts our logical grasp of the world. Facts, on the contrary, must be described by relations between events or objects, and these may be as 'irregular' as their organization requires. Furthermore, relations cannot be restricted to those holding for two terms; they may hold for three, four, or any number of terms. These are some of the reasons given by Russell for his contention that the old logic puts thought in fetters, while the new logic gives it wings. Although one may not wish to go as far as Russell when he states that "vast and imposing systems of philosophy are built upon stupid and trivial confusions, which, but for the almost incredible fact that they are unintentional, one would be tempted to characterize as puns", it must be admitted that some aspects of the philosophy of Schelling give additional testimony to his claim. However, it must be observed that the judgment of the logical procedure of a philosopher does not exhaust his significance, for historical factors must be taken into account.

It should not be too much to hope for agreement among philosophers if the methods employed are descriptive and analytical in character. For any rational standpoint in philosophy the cognitive situation is tripartite, and involves the elements of judgment as an activity, whether actual or possible, the proposition that is judged, and the domain of objects that is either indicated or presupposed. The idea of a domain, or of domains, is basic in logic. The various sciences of reality, the physical, biological and social sciences, make use of universes of discourse which are selections from the domain of reality. There is theoretical as well as practical justification for treating them separately, as distinct

[1] *Cf.* Bertrand Russell, "Our Knowledge of the External World", second lecture.

systems. Reality admits of such analysis and treatment; its facts behave in such a way, and are so organized, that we may distinguish various 'levels' or systems of existence. They are not entirely distinct, the 'higher' levels presupposing the 'lower', and certain logical and metaphysical principles holding for all levels. The transition from one level to another is accomplished by the addition, or, as may be, the modification or omission of special principles, in keeping with the kind of organization that is found. The fact that logical and mathematical principles are found to hold for reality does not alter the situation, for they hold in the sense of possibilities, or possible patterns of relations. An undifferentiated monistic theory of events would have little to say about particular events. The differences between the activity of living things and inert matter must appear in their description. The formal sciences of logic and mathematics are clearly based on the idea of possibility. This idea must be taken as fundamental in philosophy if all knowledge is to be included in its scope. If we may speak of distinct domains in the special sciences, that holds all the more in logic and mathematics, where again there are theoretical and practical reasons for holding that each system involves a domain.[2] An infinite number of domains is formally possible with the treatment of all possible classes of objects. It would be futile to attempt to define the idea of a largest conceivable domain, for even if that could be done, it would not allow for the individual differences of objects, which may only be regarded as inclusive at a given time. This point of view obviously rules out the claim of dogmatic monism, which presumes to deduce all knowledge from an absolute principle or set of principles, and which in its various forms oversimplifies the problem. There is no closed universe with which to operate. Our propositions must express facts which are found in the world of experience, or which hold for that world. The universe as the domain of possible occurrences is an open one in all directions and respects, as far as we know. On the descriptive side, therefore, we must regard the collective system of knowledge as limited and tentative in some respects. On the other hand, explanatory principles must be em-

[2] *Cf.* M. Farber, "The Method of Deduction and its Limitations", *The Journal of Philosophy*, Sept. 11, 1930.

ployed, or a pure science of relations be developed and applied to given sets of facts. The question may then arise, whether it is possible to demonstrate unity in the formal properties of occurrences or facts. The great diversity of relations and relational properties shows that that cannot be done, if the goal is the determination of one principle of unity. Even the thinnest relational invariants are plural in character as well as in number. Some philosophers may think that they find unity with respect to possible characters, such as "Every event is possibly relatable to a thinking being". But such relations are extrinsic, and do not aid in the determination of unity.

The existence of the various systems of knowledge may appear at first to imply metaphysical pluralism. The term pluralism as here used includes dualism as a special case. A distinction should be drawn between metaphysical and logical pluralism, the latter meaning the separation of knowledge into distinct and irreducible systems. Four possible combinations may result: (1) metaphysical and logical monism, (2) metaphysical and logical pluralism, (3) metaphysical pluralism and logical monism, and (4) metaphysical monism and logical pluralism. The main objection to the first possible view, that of metaphysical and logical monism, is that it sacrifices the diversity of things in the interest of unity, and that such unity would not be practically desirable in any case. The second possibility must face the objection that it is obvious—all too obvious—that all events have a place in physical reality, a point of view which is justified by scientific analysis, although curiously ignored by many traditional philosophers. The third combination of standpoints, metaphysical pluralism and logical monism, is an impossible one in fact, since the nature of a pluralistic world would preclude a monistic formulation of it. There remains the fourth possibility, that of metaphysical monism and logical pluralism, which appears best adapted to the ideals of philosophy and the existing state of knowledge. It should be observed that metaphysical monism may admit cognitive dualism as a matter of fact.

The statement that there are separate and distinct systems of knowledge may appear ambiguous at first. As far as existence in the world of experience is concerned, the object-units are not

different in the various systems. It is the type of organization or activity of the object-units that is different in the various fields of knowledge, and these differences are indicated by special postulates or principles. Let us consider the classification of the various fields of knowledge into four groups, consisting of the formal, physical, biological, and social sciences. All of these sciences, as organized knowledge, make certain presuppositions, such as the necessity of assuming ordered domains of objects, and the ideas of possibility, existence, etc. The specific differences between them are indicated by their typical ideas or principles, the formal sciences by class, system, propositions, inference, probability, consistency, infinity, number, order, and function; the physical sciences by time, space, events, causality, the conservation of energy, and principles describing chemical change; the biological sciences by 'life', variation, the survival of the fittest, and inheritance; the social sciences by conscious purpose and social institutions. Each of these sciences may be conceived to be constructed in such a way that the fundamental ideas or units of its subject-matter are distinguished from its fundamental principles or postulates. When we examine the object-units we are interested in the 'what', whereas in the description of their organization and activity we are primarily interested in the 'how', or in the behavior of things. The physical interpretation of reality holds for all groups and levels, excluding the formal, of course, which is in the last analysis auxiliary in character. The principle of parsimony in thought forbids the supposition that anything other than physical reality enters into the objects of other levels. The monism that is entertained as a program and not claimed as a solution may be called interpretational monism. The basic object-units are the same throughout all fields, despite the greater complexity of organization which is discerned on the biological and social levels. The explanation of all chemical phenomena as numerical and spatial relationships, as Planck has expressed it,[8] could in a sense be entertained for other fields of knowledge, but it would not exhaust their nature. This view may and should go along with relational pluralism. The relations are real, but do not exist independently of objects. The object-units exist, as objects, which are in various

[8] *Cf.* M. Planck, *The Universe in the Light of Modern Physics* 17.

and varying relations. There can be no objects without relations, and no relations without objects. It is not necessary to assign 'being' to relations, in contradistinction to the changing world of existence. The relations may be regarded as ways of existence and change. The *concepts* of relations that we form do not have to refer to relations that 'subsist'. It is not necessary to hypostatize such universals. The concepts of relations are patterns which are exemplified in experience and physical reality. Philosophers should take care not to confuse a necessity of thought with a necessity of existence. Whitehead's thesis concerning the reality of universals, which he has developed in his theory of objects, cannot be justified. It is true that we recognize objects as being the same, but that does not prove them to exist as universals.

The interpretation of relations is of pivotal importance in metaphysics, as evidenced in the controversy concerning internal and external relations. That question must be decided for the definition of events or objects. The alternative answers are, broadly, that all relations are internal and define the essence of an object, a view which leads to the unification of all things in a spiritualistic philosophy; or the view that relations are extrinsic and possess reality independent of the objects. The question which is raised by these views is whether a thing can be related to something 'outside itself' and still not be affected. It would be difficult to distinguish the 'inside' from the 'outside' in some instances; and the inside is a related inside. Every real thing has spatio-temporal relations and exhibits unity in at least that respect. The absolutists regard relationships as founded in an absolute principle, which is purely hypothetical in character. On the other hand, the idea of an external relation that is real is grotesque and, like its rival, incurs the fallacy of hypostatization.

The alternative theories of relations that have been presented do not exhaust the possibilities. It is necessary to take the nature of objects into account more explicitly, since every object or event is embedded in relationships. Accordingly, three versions of objects and relations may be defined: either (1) an object may be defined by itself as an absolutely independent entity possessing uniqueness; or (2) a thing may be regarded as constituted by

every relationship into which it enters, the 'what' of a thing thus being defined operationally; or (3) the mediating view may be maintained, that there is a certain minimal set of relationships, such as those of space-time, which hold for all events. Strictly speaking, there are no relations in the sense of universals, any more than there can be redness apart from particular red patches, although we find it convenient and in fact necessary to refer to types of relations conceptually. Adopting the language without the metaphysical thesis of Whitehead, we may say that there are relational events, but not relational objects. All claims that there are relational objects in the sense of universals have thus far remained unfounded, and may well be incapable in principle of adequate foundation. The second view, which holds that things are constituted by all the relations into which they enter, implies that everything is what it is because of its activity. This is in direct opposition to the standpoint of essence, as set forth by Aristotle and by those that derive from the Aristotelian tradition. It abandons all attempts to define things independently, regarding their implied identity as an open problem of speculative philosophy. What can be meant by the identity of a given entity? It must have identity for knowledge, for that is the way of knowledge, which envisages things as unities. There is in knowing what Husserl calls a "synthesis of identification", which is necessary for practice. However, that does not necessarily imply identity in reality. The presupposition of permanence must be eliminated, and the idea of identity must be held in question. According to the constitutive theory of relations, an event is always defined by its relations. The mediating view, holding that not all relations are constitutive of an event, regards a given event as being a 'what' plus a 'how'. It might be suggested that it would be better to hold the complete constitutive theory for events, and the mediating view for things or objects with endurance in experience. But it would be difficult to separate the passing relations from the relatively stable relations. If such separation is a practical matter, then no compromise is necessary. It would suffice to determine the stability of relations by means of their frequency of occurrence. Accordingly, an individual event may be defined in terms of the activity with which it

pervades its spatio-temporal region, and classes of events may be treated inductively in terms of the relational patterns which they exemplify.

In this way we are committed firmly to what we have as a matter of fact. However, if there is no demonstrable permanent identity in the world, how can we arrive at generalization? The usual procedure has been the assumption of a totality with features of uniformity, on the basis of which great assumption the inductive examination of experience is made possible. If an inductive theory of actual occurrences is only possible with such assumptions, the consideration of the concept of possibility is certain to introduce more difficulties. It is at this point that relational logic is of help to us.

A description of a given situation is always accomplished in relational terms. Relational logic makes it possible for logic to comprise all knowledge and adapts it to the changing structure of scientific knowledge as well as to the needs of experience. Freed from the limitations of the older logic, it makes logic descriptive in both the inductive and the deductive sense of the term. Objects, which may be determined descriptively or by definition, fulfil variables; and this is also true of relations, which fulfil relational functions or forms. When we speak of relations, we usually mean relational forms. We find that numerous and varied situations may fulfil the same set of variables, or be formally similar, while 'materially' different. The relational logic thus gives a far more fruitful clue than did the logic of Kant for the determination of the categories. It makes possible a postulational approach to the metaphysical problem. This includes the postulational determination of infinite domains, which is necessary in a theory of categories. There are more possible properties of relations than reflexiveness, symmetry and transitiveness, and all the more when relations of a higher degree than the dyadic are considered, *i.e.*, when one considers more complex relations, or takes more terms into account. In dyadic relations, to take a simple example, a relation may be considered with respect to four or five terms, and may hold or fail for each pair. There may be an infinite number of different relational combinations, and each has an indefinite or possibly infinite number of interpretations. If the concept of possibility is taken into account, this must be allowed. The range of variation with respect to a

given pattern is determined by the domain for which it is significant, as in the case of factual reality. The relational properties that have been indicated are merely selected from the total complex of properties which define events, so that unity can only be exemplified in limited aspects, *i.e.*, to the extent to which the variables are satisfied by a given situation. The monistic view that is becoming more and more complete because of the progress of science need not be carried over to logical or relational monism, for it is a mistaken ideal to attempt to reduce all activity-patterns to one basic set of patterns or categories. The structure of the various logical systems in formal science alone, in which special postulates characterize individual systems, shows that to be impossible, unless it be at the cost of specific knowledge. It does not follow that rival mathematical systems are all equally true, for the truth of a formal system consists in its application to the real world. Validity should not be confused with truth. The point is, then, that the description of the real world in all of its aspects cannot be accomplished by one set of principles except at the sacrifice of its concreteness and complexity. The mystical pantheists have illustrated the residuum which remains after the subtraction of specific knowledge, to cite the most extreme case. The natural-number system and people in lineal descent fulfil the same relational variables for serial order. But that is not a fruitful fact, nor is the people-in-lineal-descent situation exhausted by this observation. A great many other situations are not ordered serially. It is clear that such considerations help us to dispel a false ideal of unity. They show us that patterns of unity are always selective, and that the situations exemplifying them must be determined inductively.

There is an ever open horizon in the theoretical treatment of the metaphysical problem. Does that hold with respect to all knowledge? When we press for method, for the final justification of knowledge, and look to its foundation in experience, it appears that all absolutely ascertainable knowledge is social in its reference and significance. Everything else is relative or postulational in character. The social, which is relational by its very nature, is finite, and is as invariable as man cares to make it. That which is man-made can be man-known and controlled with adequacy. In the

field of human activity we may have all the uniformity that we will to have. In no other sphere can this be said, unless we speak of the constant hypothetical relationships in formal systems. However, such relations are changeless, and experience is essentially experience of change. We may set up fixed patterns for their explanatory or pragmatic value without implying the existence of such patterns in the changing stream of experience. Not all theoretical problems that are suggested by experience may find their solution in it. But all practical problems may be solved within its sphere, if not in its terms. The theory of infinity, which is so useful in explaining and even handling the world of experience, is an example of the latter.[4] The desire for permanence is usually sublimated in a theory of universals, in a form of Platonic realism. Why this desire to infuse permanence into a changing stream of events? May it not have a social origin? Nietzsche has well said that "Being is a fiction invented by those that suffer from becoming" (*Birth of Tragedy*). Not every theoretical question can be answered; nor is every proposition or question that can be raised in the collective system of knowledge 'definite' in the sense that it can be determined to be true or false, as is the case with definite propositions in a mathematical system. There are positively insoluble problems which will never be answered because they transcend all possible experience, *e.g.*, ultimate problems of space, time, causality, etc. These are not 'unknowable' in the sense of agnosticism, but in the evidential sense of incomplete knowledge.

Experience clearly wants more than it can have, in a theoretical sense. It is natural for man to wish to overcome the limitations of his status and to embrace all things in a convenient world-view. The tendency to simplify the problem is a response to this wish. It is possible to find patterns of unity and to organize them into a collective system of knowledge, allowing for the diversity of such patterns. The extension of this undertaking leads to the construction of a science of pure relational forms. The metaphysical problem

[4] *Cp.* Nicod, *Foundations of Geometry and Induction* 210. Nicod asks how he can know that the unknown will be simplest. That is psychological or practical in his view. Is there any inductive basis for it? We must distinguish between induction for practice, which is solved by practice, as a problem, and the theoretical problem of the inductive foundation of metaphysics, which must deal with possibilities, and hence the unknown.

then becomes one of making application to experience. Although the basic principles of logic are common to all systems of knowledge, the use to which they are put, as well as the special principles that must be added in each case, makes them distinct systems. Logical pluralism reflects the growth of knowledge, whereas metaphysical monism warns us to keep within the field of reality. Our guiding precepts must therefore be the ideal of interpreting all facts in terms of physical reality, while preserving the diversity and complexity of facts by means of special systems of knowledge. These represent the analytical and descriptive phases of the cognitive enterprise.

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THE PLACE OF A. A. COURNOT IN THE HISTORY OF PHILOSOPHY[1]

ANYONE who reads the philosophical works of Cournot[2] will find it difficult to understand why, up to the present time, he has been so largely neglected. This neglect is common both within and outside of France. Although he died in 1877, it was not until 1905—when the memorial to him appeared in the *Revue de Métaphysique et Morale*—that any concerted effort was made to bring his work to the attention of even his own countrymen. Some years later, under the instigation of Lévy-Bruhl, new editions of the *Essai sur les Fondements de Nos Connaissances* and the *Traité des Idées Fondamentales* appeared. Even yet, however, his important and original thoughts remain the prized possession of relatively few persons.

Perhaps this condition of affairs is best explained by turning to the century in which he was lost, for the purpose of discovering what led him to the position which he developed and which led to the failure of his work to find an audience.

One of the most important things to be noticed about the greater portion of French thought during the last half of the eighteenth and the first half of the nineteenth centuries is its political reference. The revolution was imputed to the philosophers. Whether really responsible or not, they became the center of attention from all sides. Those who wished to see the principles of the revolution carried out looked to them for succor; those who were opposed to the republic and sought the return of the monarchy, including Napoleon himself, looked upon them as a potential danger and did all in their power to restrict their influence. The result was that nearly every man of prominence in this period was a political figure, whatever other field might also list his name in its hall of fame.

[1] For the historical material in this article I am particularly indebted to Boas, *French Philosophy of the Romantic Period*, and Lévy-Bruhl, *History of Modern Philosophy in France*.

[2] *Exposition de la Théorie des Chances et des Probabilités*, 1843; *Essai sur les Fondements de Nos Connaissances*, 1861; *Traité de l'Enchaînement des Idées Fondamentales*, 1871; *Considérations sur la Marche des Idées*, 1872; *Matérialisme, Vitalisme, Rationalisme*, 1875. All these works are published by Librairie Hachette et Cie., Paris. In 1922 single-volume, second editions of both the *Essai* and the *Traité* were brought out mainly under the instigation of Lévy-Bruhl.

There were two immediate results of this situation. On the one hand, philosophy tended to become shallow and doctrinaire. In some cases it is not so much the goddess of wisdom as the need of self-preservation which determines what is thought and said. In the second place, the dominating interest of the philosophers became practical and social. Whether constructively or defensively, what men needed most, for their peace of mind if for nothing else, was a stable social order. This they set about to realize with the means at their disposal. Both of these factors diverted the stream of French philosophy around Cournot. He certainly was not a shallow thinker. Neither did he lower the tone of his thought for utilitarian purposes, in the meaner sense of that term. Although in later life he held some responsible governmental posts, his interest was in the more basic aspects of the problem of human knowledge as raised by critical philosophy. He was interested in discovering the limits within which the mind can work either with certainty or with a high degree of probability. Social and political phenomena have never been characterized by this sort of precision, and so did not attract the mathematically inclined Cournot, except for some efforts to reduce these phenomena themselves to law.[8] His work lay outside the field of this contemporary interest and went unheeded.

Besides these objective reasons was the more subjective one of his own character. From biographical material we learn that Cournot was cautious and retiring. His special training was in mathematics, and, as is so often the case, his investigations in this field, particularly in regard to the nature of probable reasoning, led him into the wider fields of philosophy but did not alter his temper. Although Cournot was cautious, his period was not. In France monarchy, dictatorship, and revolution followed each other with astounding swiftness. In Germany men were chasing the images of their dreams and calling them real, under the influence of a romanticism that made the will the basis of reality. The sciences were moving more and more into the control of man, and in France and England the hope was again being raised that an open sesame

[8] As in the *Théorie Mathématique des Riches* and some parts of the *Exposition de la Théorie des Chances*, notably chapters viii and ix.

to human perfection had been found. The doctrine of evolution was on the eve of specific formulation, although the general ideas that served as a background for it had long been operating in thought. This, coupled with the progress in the exact sciences, gave new color to the processes of change. Perhaps for the first time in the history of the race the great mass of men began to get the idea that in change lay not destruction but progress; that the Golden Age was of the future and not of the past. It was a period in which men were drunk with anticipation. Such a careful person as Cournot could not help but be somewhat out of tune with those times. His last two books, written after the appearance of the *Origin of Species*, specifically condemned the Darwinian thesis. He saw in it not Utopia but error and confusion. It is no wonder that he was neglected until the ardor of men's enthusiasm had somewhat subsided.

In turning to a specific examination of the movements which characterize the philosophy of the nineteenth century, it is quite fitting that the first tendency to be noted should be one based upon the sciences. Since the beginning of the modern period rationalism had been, at least on the continent, the traditionally accepted method in philosophic thought. This was due mainly to the success of the mathematical method when applied not only to speculative matters but to more practical affairs and to the sciences. With the advent of first the natural or physical, and then the biological or organic sciences as independent disciplines, a new ideal of the possibility not only of understanding the universe, but of bettering man's condition in it, began to be formed.

This ideal was expressed by Condorcet in the eighteenth century. He was thoroughly given over to the idea of the possibility of the attainment of a complete scientific knowledge. The basic difficulty with men is that they lack knowledge. They are ignorant of the world and of themselves. But this is not a necessary condition. Each of the sciences is fathoming the secrets of some portion of the nature of things. All that is needed is persistence. There is no limit to the things man may know or to the perfection of life that may follow from knowledge. There is not a single wrong, no case of suffering, which is not the result of ignorance alone and which, with knowledge, cannot be set right.

The central principle of this position is progress and perfectibility. This is definitely carried over into the nineteenth century, particularly in the social philosophy of the period. It is an idea which Leibniz bequeathed to modern philosophy in his *Monadology*, and since he set the tone of French philosophy even after the appearance of Kant and the Critical philosophy, the idea of progress, of teleology, had a double grip on the development of French thought.

Cournot was sufficiently a rationalist to have taken kindly to this concept of teleology. The order which we discover in the world, and which is for him one of the most noteworthy characteristics of it, is an order based upon a régime of reason. To this extent he is in sympathy with the supposed teleological reference of scientific knowledge as held by Condorcet. But from this it does not follow that he is equally inclined to agree with the latter's conclusions of the possibility of perfected knowledge which would allow us to develop into a race of supermen. True it is that science is teleological in so far as it is rational. True it is that the progress of science means the progress of human knowledge. But the universe is not wholly rational, and therefore it is impossible for any being, including God, to have a perfect knowledge of it.[4] Beside the facts of order and continuity are the equally real but often neglected facts of discontinuity and contingency.[5] Thus certainty and complete knowledge vanish into thin air and Condorcet's structure gives way not only before the brute fact of the French Revolution, but also before a theoretical position which seems more in accord with the world as we experience it; a position which definitely precludes the type of knowledge that would enable man to gain complete control over his destiny. It remains outside the power of any being, even God, to predict certain things prior to their actual occurrence. In this position Cournot removes himself once and for all from the school of hope.

In the nineteenth century this tendency to think in terms of perfectibility rather paradoxically found expression in positivism. It is true that Comte did not emphasize this, particularly in his early thought. His problem was not so much the perfectibility of

[4] For the development of this point see the *Essai*, chap. ii.
[5] *Cf.* Milhaud, *Études sur Cournot* 28.

knowledge as its limitation. It is at this point that positivism ties up directly with the sciences. Positive knowledge is scientific knowledge. It is concerned with the laws which order facts, which laws are what is meant by science in the true sense of that term. Of a reality beyond these laws positivism knows nothing, and indeed has no need for knowing anything else for the realization of its own purposes. This gives it the agnostic tone characteristic of French materialism.

The confusion in philosophic thought in the past was due to the fact that it was mixed up with theological and metaphysical ideas. These can never bring men together; they are inherently divisive.[6] The goal of the positivistic method is unanimity and agreement, and this is possible only in the field of the sciences. One of the important methodological devices that Comte used to good advantage in attempting to attain this end, although he was far from inventing it, was that of the classification of the sciences according to their generality and the order of their appearance as separate disciplines. Had Comte stopped at this point he would have remained within his own principles; but of course he did not, and the leap to sociology was too much for him. Even science, it seemed, was not adequate to bind men together into a homogeneous society. This lack led to the formulation of the positivistic religion and its subsequent spiritualistic development. As we shall see later, spiritualism was almost universal in French thought in this period and so it is small wonder that the more sceptical bent was blotted out in Comte's latter work and by his successors.

While Cournot had much in common with Comte,[7] standing as he did between the latter and Renouvier in the development of critical philosophy, he would not have agreed at all points with his contemporary even prior to the latter's defection towards religious speculation. In the first place, Cournot would never have thought of the goal of scientific endeavor in sociological terms. It is true that after his *Théorie Mathématique des Riches*, published in 1833, he had the idea that organized societies offer to the scientist

[6] However, Cournot is unalterably opposed to any attempt which would identify philosophy and science and on this point, as well as on the ground of its architectonic character, is diametrically opposed to the positivists. See particularly *Considérations* II 222 ff. and *Matérialisme* 190 ff.

[7] *Essai*, chap. xxii; *Considérations* II 221-230; *Matérialisme* 170-194, 237-379.

mechanisms which can be dealt with mathematically just like physical mechanisms. But this does not have the same implications for Cournot that it had for Comte. For the former it is simply an illustration of the applicability of reason to phenomena usually regarded as lying outside of the field of rigorous thought. For the latter it meant that society is an integrated whole, the glue that holds the parts together being found in the later development of the positivistic religion.

But there is a much more fundamental difference than this. Cournot does not use the classification of the sciences as a methodological device and he is not of the opinion that all that knowledge can attain is an appreciation of scientific laws.[8] At this point positivism is too limited for him. He cannot get away from the legitimacy of reason. It is reason which serves throughout as his methodological basis. Classification has ontological implications. The very fact that it is possible for the sciences to be arranged in such an hierarchical order as is proposed by Comte, indicates that there is a definite and understandable gradation in the complexity and interrelatedness of *things*, and not only of the scientific laws which we have at our disposal. If this latter alternative alone were true we should have no evidence that the order in which the sciences are arranged by us has any inherent relation to the corresponding orders of things which all scientists presuppose as the objects of their consideration. In this direction lies the position of Poincaré and others who say that scientific laws are mere conveniences. We state relations between things in a certain way, not because we know them to be related in just this way to the exclusion of others, but because that statement best suits the purposes that we have in mind. It can be easily seen how this pragmatic doctrine grows out of the position that Comte takes. But it is untenable unless we wish to give up to some form of subjectivism. So, at least, Cournot sees the problem. The reason why we formulate certain laws rather than others, the reason why we arrange the sciences in one way rather than another, is, according to him, that experience tells us that their subject-matters are related in that way quite apart from our knowing or doing.[9] The defense of his thesis involves the

[8] *Essai*, chap. xxii.

[9] Darbon: *Le Concept du Hasard dans la Philosophie de Cournot* 1 and 2; Milhaud, *Etudes* 93-98; *Essai*, §§ 1 and 89; *Traité*, chap. 1, §§ 17, 42.

concept of order as a fundamental category and rests upon the argument of probability.[10] In some cases we can never be *certain* whether the connection between events is due to chance or to the *reason* of things. The question can only be settled by repetitions of the event under consideration, in which case the repeated coincidence of the factors in question proportionately increases the probability that the conjunction is due to reason and not to chance. In some cases this probability becomes so great that the rational character of the event in question can be regarded as practically certain. The same argument holds for the classification of the sciences. It is so infinitely unlikely that we shall agree to one classification to the exclusion of others on the basis of mere convenience, that we have reason to believe that a classification which finds wide agreement indicates something more than a subjective ordering of the phenomena in question according to their relative complexity.

It is only fair to point out that there is weak ground here unless one states one's position carefully and accurately. The fact of the matter is that there is no exact agreement as to the way in which the sciences should be arranged. Indeed Cournot himself proposes a new and distinctive arrangement as compared to Comte's. Yet at bottom the progression from the most simple and general to the most complicated and particular, as found in the progress from mathematics to botany, or even to psychology or sociology—if the latter can be included as sciences—is quite definitely agreed upon. Therefore it seems likely that it is objectively valid, not because most men agree to it—an argument to which Cournot justifiably takes exception[11]—but because it is infinitely unlikely that anything but the objective and independent correlation of the subject-matter with an external natural order can account for the similarity of treatment given that subject-matter by thinkers working independently of one another.[12]

Besides the two positions that we have just considered, there are three others which must be examined if we are to orient Cournot in nineteenth-century French philosophy. These are sensationalism or ideology, eclecticism and traditionalism. The first is a direct out-

[10] *Essai* §§ 46 to 52 inclusive.
[11] *Exposition de la Théorie des Chances* 421.
[12] *Op. cit.* 420.

growth of the philosophy of Condillac. Like the English empiricists he accounted for all mental phenomena in terms of sensationalistic units. Sensations are the only things of which we can be sure; they alone have the character of immediacy. We are in complete ignorance as to their causes. Therefore we move inescapably in the field of sensations.

The method of this philosophy is analysis. We have ideas, feelings and desires and we make judgments about them. But these mental facts are complex; we cannot fully understand them as they are given. They must first be broken up into their simpler components which are individual sensations. These are combined in certain ways rather than others through the influence of habit. The effect of Locke is apparent in this position, but Condillac went further than Locke; he completely denied the place which the latter gave to reflection. For Locke reflection is a source of ideas on the same footing with sensation. Not so for his French disciple. Sensation only, is his cry. Locke's difficulty was that he failed to carry his own analysis far enough. There are no innate faculties of the mind, and, paradoxical as it may seem, instinct itself is acquired.[13] As sensation undergoes modification it becomes successively attention, memory, comparison and judgment. Nothing outside of it is needed to account for any mental phenomena whatever.

This doctrine is but one indication of the prevalence of the psychological in the French thought of this period. It is not only found in sensationalism, but also appears in ideology, which is an offshoot of the school we have been considering, and in eclecticism, the official philosophy in France after the revolution. To be out of sympathy with it was to be largely out of touch with much contemporary thought.

Yet this is just the position in which Cournot found himself. In the first place, along with Comte and other positivists, he does not accord a place among the sciences, properly so called, to psychology. He did not mean to imply by this that there is no value in any of the data with which psychology deals, nor that they are not valid when used in certain forms of reasoning.[14] The difficulty is that

[13] For the development of this rather incongruous position see Lévy-Bruhl, *op. cit.* 278.

[14] *Essai,* chap. xxiii.

these data are uncertain; they are not amenable to the type of treatment which, on the one hand, in some sciences gives high and even infinite probability, and, on the other hand, in the rational sciences gives certainty. But this is not the only reason why Cournot mistrusts the use of psychology as the basis of a philosophical system. To use it thus is to take the final term of the series of sciences and use it as the first term. Not only will psychology be among the last of the sciences to be set up as independent branches of learning, but the material with which it deals, its peculiar subject-matter, is the most complex of all and presumes as its basis the less complex matters that are dealt with in the successively less complex sciences. Therefore it should not be made the basis of explaining them.

Of course the motives and interests that lay behind the elevation of psychology to this position can be understood. For one thing, it was the newest attempt scientifically to account for mental phenomena, and some thinkers are forever prone to use new material, new hypotheses, even though inadequately tested, as a foundation for philosophic speculation. Then, as another reason, the psychological explanation fitted in perfectly with the teleological motives that directed most of the thought of the period. After all, if one conceives the whole process of nature as being directed towards the accomplishment of man's perfection, assuming of course that one knows what the whole process of nature and what man's perfection are, there is some reason for placing psychology in the central position of one's thought. The romanticists, the sensationalists and the ideologues, as well as the sociologists proper, all shared high hopes of this sort. Cournot did not. At least they were not so over-weighty as to allow the reversal of the natural order of the sciences simply to help along a cause. So he left psychology pretty much in the background,[16] although he did admit that if thinkers were not too pressing, too ambitious, a certain psychology was possible in 1851. That he includes it in his classification of the sciences, but among the biological, along with phrenology and physiognomy, and not in the group of noological sciences, as one might expect, is both interesting and suggestive.

[16] *Essai* 540, 541; Milhaud, *Études* 24.

But if Cournot, agreeing at this point with positivism, allowed but little place to psychology as a science, he gave even less place to the function of sensations in human knowledge. Here there is no mistaking his attitude.[16] With the single exception of the sense of touch, which he holds to be truly representative of the external world, none of our senses is necessary in order that a person may have all the knowledge that is essential for the development of abstract science, and for such particular sciences as mechanics, astronomy, physics and chemistry, which have to do with rational rather than empirical relationships. Of course it is not difficult to discover that this "essential knowledge" is composed of those colorless and unvariegated ideas and principles that mathematicians and mathematical philosophers have always held to be the quintessence of truth and reality because they are universal and certain.

This does not imply that sensations and the organs of sense have no value at all. They do have definite survival-value for individuals and for species; and this value is not infrequently imperative and all-inclusive. In this capacity the other senses are not only on a par with that of touch, but in most cases surpass it. They inform us of the presence of objects at a distance in a way which is impossible in the sense of touch. Thus sight, smell and hearing bring us intimations of both danger and succor before action is actually required. The sense of taste also, to some extent at least, enables us to discriminate between beneficial and harmful foods. But these are biological, pragmatic functions and not epistemological or metaphysical devices.

That Cournot makes a very arbitrary if not false use of this distinction is rather clear. It seems quite high-handed to limit knowledge to that which can be formulated in mathematical laws; to do so neglects the empirical basis in terms of which the content and limits of science are discovered and checked. Still, we can understand why he takes this attitude. As previously pointed out, he was a mathematician before he was a philosopher. Naturally he carried his mathematics over into his philosophy, as evidenced in his adherence to certain rationalistic presuppositions and methods which at times seem one-sided and inadequate in the light of his

[16] *Essai*, chap. 7; *Traité*, I viii; *Considérations* II 46; *Matérialisme* 47-59; Milhaud, *op. cit.* 11.

own more empirical moments. For cosmological purposes the invariable laws of science, with all their formal and rational aspects, may be most valuable. But these laws themselves depend upon experience which contains irrational elements. If the senses aid, as they clearly do, in the discovery and the delimitation of knowledge and in the awareness of the significance of certain rational principles or relations rather than others, it is important to give recognition to their place and function in knowledge.

In this connection we must hasten to point out that though sciences might, according to him, be developed without the senses, Cournot often insists that our scientific and even mathematical principles must constantly be checked with experience.[17] He even goes so far in one place as apparently to contradict himself by saying that we reach our conception of intelligible things only through the instrumentality of phenomenal and sensible things.[18] This indicates that his rationalism is modified by empirical checks which become the theoretical as well as the practical basis for discontinuity and contingency in nature.[19]

Whatever conclusions follow from his treatment of the senses, we can readily see why he found himself quite outside of any position such as that developed by Condillac or that of the ideologues, to which we now turn.

As indicated above, ideology was an outgrowth of sensationalism. The two most important figures in the early development of this doctrine are de Tracy and Cabanis, who were thoroughly in agreement with Condillac's statement of the unknowable character of first causes. This was a philosophy which was designed to supplant metaphysics. Its general character is that of a radical empiricism, the method of which consists in observing facts with the greatest care and in drawing from them only the surest consequences. But this school goes farther than its predecessor. The statement that everything in mind is nothing more or less than transformed sensation is a patent excess. Such a position neglects the reality and efficacy of the will or volition. Sensations always carry a reference to an external world, even though they give us no knowledge of it. But besides these externally referent sensations

[17] *Matérialisme* 283, 284.
[18] *Traité*, § 17.
[19] *Matérialisme* 284.

there is a whole system of inclinations, desires and wishes which are indicative of a group of impressions almost wholly unconnected with the external and, for the school in question, unknowable world. These are impressions of the 'self'; internal sensations which inform us of our existence and belong to a world which is entirely undetermined and free. In fact, it is contended, if it were not for the possibility of movement and the experiences of resistance which follow from this latter fact, we should never have any idea of anything beyond ourselves.

The direction in which this position drifted can be easily imagined, its tenets being similar to those of the German romantic philosophy of the same period. As developed by Laromiguière and Maine de Biran its conclusions are fundamentally the same as those of Fichte and, more particularly, of Schelling. The soul or the Ego again takes on an autonomous character wholly lacking in Condillac. This is indicated by Laromiguière's insistence upon the distinction between the activity and the passivity of the soul. It is not enough to deal only in terms of sensations, which are passive, for we *look at* things quite as much as we *see* them; we *listen to* things quite as really as we hear them. This active, causal aspect is overlooked if our experiences are stated only in sensationalistic terms. Maine de Biran develops this principle even farther. In him the revolt against passivity and the movement towards the elevation of the Ego is in full swing. This Ego or conscious personality is immediately aware of its opposition to the background of dim unconsciousness which enfolds it. In itself this background is perfectly meaningless. It is only through the action of the Ego that it takes on definite characteristics and import. In this connection the mind expresses itself as a cause. It derives its concepts of substance, unity and existence by abstracting from its own nature and isolating its own attributes. In this way not only the seat but the source of these attributes is found. If then we again find them in nature it is because they have been projected into it by the Ego. Nature, therefore, comes back to the mind, and instead of our ideas being derived from sensations which refer to external, objective existents, the opposite is true and the Ego is the ground of that which subsequently presents itself under the guise of externality. The only limitation is that the whole process is relative. This follows

from de Biran's feeling that the Ego itself is relative. Therefore, since the cause is limited the effect must be similarly limited. This has a tinge of the scepticism of the phenomenalistic and sensationalistic school from which it sprang. But it is so foreign to its main outline in other respects that it is quite legitimate to say that de Biran has quite definitely left the ideologues and has developed out of their principles a romanticism similar to that flourishing at the same time in Germany.

What we have said above as to the scientific basis of Cournot's thought, of his assurance of the *de facto* existence of an independently real world that can be known to us within limits of probability which are often so great as to yield practical certainty, and of his native precaution against extravagance and imaginative flight, makes it clear that this movement too was wholly out of relation with his interests and inclinations.

The same is true in regard to still another tendency, but one which looked in the opposite direction. On the whole Cournot is in sympathy with the concepts of progress and teleology which are so characteristic of the thought of this period. The only objection he would have to make in regard to them is their use in bolstering up false hopes. Certainly if there is a golden age at all he would have agreed with his time in thinking of it as lying in the future. But this is contrary to the opinion of an important group of Catholic reactionaries. Led by Bonald and de Maistre, this group sought a return to the Middle Ages. In their minds at no other time in history had men so nearly reached the ideal of unity and stability. These thinkers were completely out of touch with the experimental and analytic procedures of their contemporaries. The true method, according to them, is synthesis; this alone is the road to the One, to eternal Truth. These cannot be discovered by processes of division and separation; things must be seen in their totality. The temporal and the changing are by nature evil and destructive. Time is not the great creator that men were coming more and more to believe it to be, under the influence of the coming dawn of a definitely formulated statement of evolution. Time only destroys that which in the beginning was perfect. Knowledge in its deepest aspects was completely revealed to the first man and our meagre efforts can add nothing to it. Therefore for truth we should turn to the traditions

of the race. These are true not because of accumulated insight, a doctrine which is acceptable to some sociologists even today, but because their origin lies nearer to the beginning of things; nearer to the creation of the human race, when the first man listened attentively as the whole scheme of things was laid before him, with the tragic and fatal exception of the knowledge of good and evil which, presumably for some omniscient reason, was denied him. This movement being definitely reactionary was, of course, doomed to failure from its inception. None the less it is instructive as pointing out the spirit of the nation following the collapse of the revolution. That none of the more progressive tendencies could find anything in it goes without saying.

The official philosophy in France in the early decades of the nineteenth century was eclecticism. With one aspect of it Cournot was in perfect harmony. This was the emphasis that it gave to history. The reader of the *Essai* and more particularly of the *Considérations* is impressed with the acquaintance which Cournot had with the development of thought in the fields of philosophy, science, religion and social affairs. In this connection I think it not at all an exaggeration to say that he, more than any other French philosopher of the period, with the possible exception of Comte and Renouvier, belongs to the great historical development of systematic philosophy. This is due in part, no doubt, to the fact noted above that most of the men of this era had political hopes. Cournot was almost wholly free from the limitations that follow from the pursuit of such ambitions, at least so far as his writing is concerned. Consequently he saw his problems in the light of a wider perspective than others of the same period and as a result his work has a lasting relevance which that of most of his contemporaries lacks. But this is not the only reason why his thought is of more value to us than it was to his own day and of more value to us than that of most of the others whom we have been considering. Cournot did not allow momentary interests to bind him and to warp his thought. He constantly turned his attention to the basic and persistent problems of philosophy with the result that his work is important for all later thinkers who attack the same problems. On the other hand, in practically every case when the political fortunes of the other men were upset, the thought that they represented was

seen to be shallow and biased and of no lasting importance outside of their limited and polemic purposes and for the writer of historical records. This is not intended as an altogether derogatory statement. The fact is that on the whole other problems were so pressing that there was relatively little time for the consideration of philosophical problems in their own right, and without considerations as to the use that could be made of them in dealing with the dominant social and political problems. Most of the thinkers in France during the last half of the eighteenth and the first half of the nineteenth centuries lacked the possibility of detachment and leisure which, as Aristotle pointed out, is requisite for philosophic contemplation and speculation. Eclecticism brought a new interest in the history of philosophy and in the philosophy of history, an interest with which Cournot has real sympathy.[20]

Possibly the most striking indication that Cournot occupies a place of real importance in the development of philosophical ideas is found not by comparing him to the thinkers of his own period but rather in showing his anticipation of many of those who have suggested fruitful lines of development in recent philosophy. In this connection there are three tendencies that are at least suggested in Cournot, even though he is not actually responsible for the form in which they later appear. These are (1) the development of the basic idea of emergence, that is the successive appearance of irreducible, though dependent levels of existence, as over against mechanical or repetitive evolution; (2) the vitalism of Henri Bergson; and (3) the philosophy of contingency as exemplified particularly by the writings of Émile Boutroux. Each of these movements occupies a position of prominence in the philosophical discussions of the present time. If they can be shown to pass through or to be influenced by the work of Cournot even though it would be an exaggeration to contend that they spring full blown from his thought, his importance as a thinker worthy of serious study and consideration would once and for all be established.

Darwin's *Origin of Species* appeared early enough to allow Cournot to give a critique of its general position in the last two of

[20] The *Considérations* is a philosophy of history dealing with the development of ideas from the Middle Ages into the nineteenth century.

his philosophical works.[21] His principal objection to the new hypothesis is that it is materialistic and gives no place to the distinctive characters of organism and mind. The highest as well as the lowest forms of being are amenable to the same categories at least as far as their origin and their nature are concerned. There is an inevitable movement from the environment to the organism, and the changes that take place in the latter can be accounted for by laws that describe the behavior of material processes modified only to the extent of accounting specifically for the modification of the organism in terms of the environment. The process in operation is that of survival. Those organisms persist which are able to modify their structure in such a way as to compensate for proportional environmental modifications. But this compensation does not imply processes on a different level from those which account for the mutual effect of two or more material bodies or systems upon one another. The forces at work in both cases are purely mechanical.

Cournot is insistent that such a program of explanation is impossible. He bases this reaction not upon the apparent independence and priority of the moral nature of man, as did Kant, but upon the more theoretical but at the same time seemingly more justifiable position of the reality of contingency, discontinuity and the plurality of orders of existence as actual characters of the universe. He feels that any attempt to account for all events with but a single set of categories oversimplifies the problem and gives no real clew as to the actual nature and complexity of the universe. He bases his statement upon a demand of reason, not of the will. The exact extent of the discontinuities is not clearly indicated in the *Essai*, but in *Matérialisme, Vitalisme, Rationalisme* three levels of existence—as the title itself indicates—are clearly demarcated and each is regarded as being distinct from the others, having its own categories and its own laws. This degree of discontinuity at least is necessary to insure the reality of chance, which in Cournot's treatment depends upon the unpredicted and unpredictable interaction of series of events which are causally independent of one another.

[21] *Considérations* II, Bk. 5, particularly Chaps. ii, iii, and v; *Matérialisme*, Sec. 2, particularly §§ 4, 6, 7, and 8.

The theory of levels is thus introduced as the answer to a positivistic demand.

What is said in this connection must not be construed as an attempt to prove that the later development of the idea of emergent evolution was due to Cournot's statement of the problem of levels. Yet it is true to say that in the ultimate distinction and separation of these three levels of being, he sets forth a thesis which is basic in the work of S. Alexander, C. Lloyd Morgan and others. What Cournot did not see was that his idea of levels could be integrally connected with that of evolution. He was not under the influence of the relativistic, evolutionary spirit of the next century. For him being was still absolute and the only way in which variety could be introduced into reality was by the separation of the latter into absolutely distinct and mutually independent orders. This left him with levels but with no way to pass from one level to the other and still maintain the essential differences between the laws of one level and those of the others. This results in implicit internal difficulties in his system not unlike those inherent in Cartesian dualism.

On the other hand, perhaps Cournot did catch glimpses of the interrelationship of the different levels. Of one point he has no doubt: the phenomena of the higher and more complex levels necessarily presume the existence of the levels below them.[22] If this were the only point in question we might say that he is even more specifically anticipating the later writers than we implied above. But there is a shifting of his point of view that makes it seem that he himself was not quite clear as to the problem of the interrelation of the levels. The problem presents itself to him in the task of the classification of the sciences. In the *Essai* the major difficulties are found in the transportation from the mathematical to the physical sciences, from the physical to the biological sciences, and finally from the biological to the rational or noetic sciences. This is just the problem of emergent evolution. But Cournot does not persistently treat the difficulty as arising only at the points of transposition between the different orders of being. In the *Traité* he seems to indicate that the real difficulty in the continuity of the

[22] *Considérations* I 218; *Matérialisme* 123.

sciences is found on each level at the point where a transposition is made between ontological and cosmological, or, as we would say, between the pure and the applied sciences. In this form the question is not one of moving continuously through a series of various orders of being, but that of using abstract laws, or ideal construction, in the explanation of actual events on each of the levels. This changes the color of the difficulty by making two sources of discontinuity, one between the rational and positive elements within each level, the other between the different levels. As a result of this shift we are led to the supposition that although Cournot first stated the problem in about the same form as the emergent evolutionists give, he was led to it through considerations different from theirs.

So much for his connection with this movement. We shall have much less difficulty in pointing out his close connection with the concept of vitalism as developed by Bergson. In dealing with the phenomena of living forms both of these thinkers introduce the idea of a special vital principle. Cournot calls it just that,[23] while Bergson refers to it as an *Élan vitale*. The function of the principle is the same in both cases. It is regarded as absolutely impossible to interpret organic phenomena in purely physical terms. The very complexity of organic forms is the first difficulty met with in any attempt to the contrary. Even in the simplest living things it is quite impossible to deal with their behavior only by means of the laws of physical and chemical phenomena *per se*.[24] The avowed materialist or mechanist admits this difficulty but accounts for it in terms of human ignorance. As our knowledge increases, physical laws will be extended farther and farther and will be seen ultimately as including all reality. As is often pointed out, one device that has persistently been used by thinkers of this persuasion has been to deny the reality of anything that is not amenable to this treatment. Needless to say this high-handed way of dealing with the problem is not very acceptable. But not all mechanists have taken this tack. They admit the present impossibility of complete explanation of these vital phenomena but point out that problems that were previously thought to be insoluble by means of mechani-

[23] *Matérialisme* 93.
[24] Bavink, *The Natural Sciences* 322 ff.

cal principles and physical laws have since been shown to be continuous with fields in which this type of treatment does admittedly apply. This answer is much more forceful than the other, and while it does rest ultimately upon an appeal to ignorance, which may be condemned as rather dangerous ground for either positive or negative arguments, the tendency seems to have been towards, rather than away from, the extension of physical laws in the direction indicated.

In the last analysis, it is altogether likely that the problem is one to which only a probable answer can be given, since there is no evidence to lead us to expect that our knowledge will ever be sufficiently adequate to make categorical demonstration possible. Furthermore, we feel that there is good reason to believe that this probable answer will favor some form of pluralism rather than monism, whether the latter be materialistic or spiritualistic. Every attempt to treat vital and rational phenomena as nothing more than physical and mechanical events of great complexity, and vice versa, has failed, and with each failure in either direction the probability that future efforts of similar nature will also fail is increased proportionately.

Certainly Cournot and Bergson would agree to the impossibility of the first mode of extension, but Cournot would have disagreed completely with Bergson's attempt to make vital forces ubiquitous. Bergson not only makes use of the special principle to account for vital phenomena but attempts to build a metaphysics upon the basis of the *Élan vitale*. This is just as fallacious as the attempt of the mechanist, for, in Whiteheadian terms, each is an instance of the fallacy of misplaced concreteness. Cournot uses the vital principle only for explaining phenomena at the level of life. But beyond this level in either direction the vital principle has no more efficacy than have mechanical principles within it. This is another indication of the positivistic element in Cournot's thought which keeps in check the extension of his rationalism. He was interested in the accurate use of ideas in the extension of human knowledge, an attitude shown in the fact that his work centers around the critical questions of the possibility and limitation of knowledge, rather than upon the extension or defense of metaphysical systems as such,

based as they are upon attempts to generalize completely, under the propulsion of some such principle as that of continuity, what is after all only partial.

This is particularly well illustrated by his feeling in regard to the questions of probability and of the contingent character of reality—a problem which perhaps clearly indicates the adjustment between the rational and empirical elements of his thought. It would perhaps be an overstatement to say that his thought has no metaphysical motivation whatsoever. But on the other hand it shows a tough-minded use of facts of experience rather than principles, logical or otherwise, in the defense of his theses which indicates that he was motivated more strongly by a positivistic desire to stay within the limits of experience than he was by a desire to substantiate a special metaphysics or to defend a set of ultimate concepts. In fact this is the ground for one difficulty with his thought. As Milhaud points out in his *Études sur Cournot*[25], the use of illustrative material rather than ideas or principles to demonstrate his points makes it difficult at times to know just what means he would use in the defense of the position he is taking, although the point at issue may be perfectly clear and also his point of view, in a denotative sense.

This is somewhat the case with the ideas of contingency and probability, in that he constantly states chance to be a fact in our experience but uses illustrations to indicate it without at the same time stating and defending the more theoretical issues involved in this attitude. But for our immediate purposes the thing of importance is that he 'took chance seriously', to paraphrase the contemporary attitude towards time. It is interesting to note in this connection that he limits the deterministic character of reality not because he has any particular axe to grind, but because he thinks the idea essential to the explanation of certain aspects of our actual experience. Kant limited the phenomenal world, the world of science, of determination, because he felt the compunction to make room for faith, to save some realm of being for the free play of the moral self, and thus preserve the dignity of man and give added worth to human existence. Cournot felt no such impulsion. The idea

[25] Chap. ii.

of chance, contingency, discontinuity is no sop to certain subjective feelings; it is required if we are to take adequate account of certain objective characters of our experience.

Why this is required and how he attempts to indicate its essential character will not be considered here. Our interest now is to show that in this objective description of contingency he anticipates if he does not influence thinkers who follow him[26] and especially Boutroux, whose thesis *De la Contingence des Lois de la Nature* appeared in 1874, the year before Cournot's last philosophical work, *Matérialisme, Vitalisme, Rationalisme,* but after the *Essai* of 1851, the *Traité* of 1861, and the *Considérations* of 1872, had already given a fixed place in French thought to the idea of contingency. Boutroux and Cournot are in fundamental agreement on the function of this concept, as is also the contemporary French philosopher Meyerson. It is possible in the accumulation of data to discover certain determinable causal sequences. But when we try to apply our generalizations in particular cases we find that there are novel and unpredictable features accompanying them which we can never bring within the limits of the law. As our experiences are multiplied the contingent elements tend to cancel one another out so that we can use the general principles that are left without having to introduce exceptional and irreducible elements. But no experience ever conforms strictly to a law. There are deviations which, when applied in even the most exact sciences, make necessary the introduction of certain coefficients of error, not wholly to be accounted for in terms of inaccurate instruments and indelicate observations, before the particular experiment can be shown to conform to law. The implication drawn from this by these men is that reality is not completely interrelated, but that there are independent series of causally connected events which interact in unpredictable ways. This position is basic to the whole of Cournot's philosophy, and, while he may not have given as explicit a statement of the principles involved as is found in the work of Boutroux, he at least definitely anticipates the thought not only of his immediate successors but also of many of the most progressive thinkers of our own time.

From the historical treatment presented here, it seems evident

[26] This is interestingly suggested in the title of a study by Mentré: *Cournot et la Renaissance de Probabilisme.*

that Cournot lies much more in the channel of the deep stream of philosophical thought than most of his contemporaries, and in his implicit and in some cases explicit anticipation of later problems shows himself to be worthy of much more serious attention than has been afforded him up to the present time. It is seldom that one picks up the works of a relatively little known author of a previous century and finds in them considerations that are so surprisingly contemporary. To neglect him is to deprive oneself of fruitful hints and in many cases quite satisfying answers to many questions that cloud the horizon of philosophic discussion at the present time.

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DISCUSSION

METAPHYSICS: THE DOMAIN OF IGNORANCE

THE neo-positivistic challenge that metaphysics is meaningless has gone unanswered—perhaps because the answer is so obvious. The neo-positivists have remarked that metaphysical assertions are not empirical or scientific and that the objects of metaphysics cannot be denoted or directly inspected. This observation, I think, is just. But granted it, what then? Are not assertions about the existence of atomic facts, about the status and meaning of propositions, about the externality of relations, about the significance and validity of analysis, about the correct interpretation of the nature of significant questions, about the reality of possibilities, non-empirical? And does not the neo-positivistic critique hinge on just such assertions? Is it possible to frame any criticism or defense of metaphysics without making these or similar assertions? Every view which pretends to truth holds in solution a theory of meaning which supposes a referent external to but essential to the truth and being of the abstract propositions. These referents are non-empirical in any sense in which the propositions are empirical, and are not known in any sense in which the propositions are or can be known. There is no strength in the criticisms of the neo-positivists not only because they arbitrarily, and I think erroneously, assume that there are no internal relations[1], that there are atomic facts and meaningless questions, but because an acknowledgment of a non-empirical realm is essential to the meaning of everything that could be grasped.

The domain of metaphysics is the realm of ultimate ignorance, profound and inexhaustible. Yet it is not a field of haphazard guess or arbitrary certainties. Its object is an unknown (not an unknowable), which we can never inspect or denote. Yet it is an object of which we must and can speak, whose nature we can progressively construct and which must be understood if nothing is to be unintelligible. It is something of which we are ignorant, and our knowledge that there is such an object of which we are ignorant is absolutely essential to the meaning and being of everything else we know.

[1] It is one thing to affirm or deny that there are no internal relations and another to affirm or deny that some relations are not internal. Of these four possibilities the positivists and realists, on the one hand, and the objective idealists, on the other, have chosen the very opposing pair which can be and are false. Deny the idealistic thesis that all relations are internal and the realistic thesis that no relations are internal—that reality is an unknowable, all-engulfing Absolute or that all realities are simples in aggregation—and it is then possible to say what every one knows: There are organisms having a mass which is the summation of the masses of their parts. It is a sad commentary on the state of recent philosophy that there seems to be no one who can assert this truth unambiguously without ruining his system.

We know that there is something of which we are ignorant? This surely is a paradox. So far as we *know* there is something of which we are ignorant, we are not ignorant of it. And so far as we are ignorant of it, how can we know that there is something for us yet to know?

The Euthydemus of Plato resolved this paradox by flatly denying that he was ignorant of anything. Having rejected the possibility of learning and of error, he was left with the alternative of being fettered to the present by asserting 'What I know, is' or of being blinded by divine omniscience in asserting 'What is, I know'. He chose the latter alternative; it remained for subsequent philosophers to choose the former. For mortals caught in the turmoil of finite existence, beset by error, engaged in inquiry, painfully trying to know, neither alternative is possible. The truth that we are ignorant is bitter but unavoidable, so long as knowledge is our goal and inquiry our *métier*. To say that there are some things of which we are ignorant is but another way of saying that our questions, predictions and theories have significance and that there is a world other than our ideas, independent in being and design. Were we not ignorant, no questions would be necessary or unanswered, and there would be no reason for believing that there was anything outside our immediate consciousness, so that error, reasoning and memory would be impossible, while analysis and action would be futile.

The assertion that we know that there is something of which we are ignorant does not mean that in the past we learnt that there were things we did not know, for then we could not explain how we could know that the things we learnt were previously unknown, or acknowledge that children ask questions in order to learn and not because they have learnt. No past experience can reveal that there are things we do not now know. Nor can our knowledge of ignorance be reduced to a principle at the basis of all our inquiries, making it possible or necessary for us to know, for that involves the unwarranted assumption that we are ignorant in general and know it, before we have a knowledge of our ignorance of particular things. Nor can we know we are ignorant of something, merely by examining the content of what we already know, for no content as such can reveal that there is anything beyond it. If our content were self-contradictory, changing or vague, what in it could make us go beyond? This view fails also to explain how there could be any questions posed on an unreflective level, and fails to explain the drive towards knowledge on the part of those who are not aware of just what it is that they do know. It is the virtue of these several views to have recognized that our knowledge of ignorance is a truth supported by past experience, basic to all knowing and substantiated by reflection. Their defect lies in the attempt to emphasize one of the factors to the exclusion of the others.

What we know are abstractions, known and used as such, *i.e.*, entities which are dependent on something other than themselves for their being and meaning. Everything that can be grasped is something that is—a character or datum which is present, or a presence which has some character. Nothing could be present without being something. Otherwise it would be a bare *it*, a universal without a nature, nothing at all. To be a datum, on the other hand, and not be at all, is to be impossible. It is to be a sheer universal actually here-now as a unique particular. Merely to confront a datum or a presence is not to know either. A knowledge of either means a reference to the other. Yet so far as we have a presence we give up its character, and so far as we have the character we give up its presence. This is the principle of indeterminacy in knowledge, for the more we have of the one, the less we have of the other.

To make a datum its own presence is merely to affirm that the datum is a fact, and to make a presence its own datum is merely to affirm that presence is something. But to make these assertions we must neglect the presence of the original datum, or the character of the original presence, for only when we have the presence and datum in abstraction from each other can we speak of them, and thus affirm their interdependence. Knowing, in other words, always involves a synthetic unification of externals, referring to an internal unity not had. The assertion that the datum is its own presence, or that a presence is itself something, is just as synthetic as the assertion that the datum has a presence elsewhere and that the presence has some specific character. The knowledge of a presence or a datum demands a reference to the other now external to but necessarily internally connected with it. Without the externality there would be no pair of terms and thus nothing that could be said; without the internality there would be no unity of datum and presence to make a proposition true.

So far as we do not know what the other element is which is to be had externally in knowing, but which is internal in fact, our knowledge of any content depends upon the ignorance of something else. This may be termed correlative ignorance. It is the ignorance that besets daily life and which is daily conquered. For our present purpose it has no value except to mark a stage in the progress from the interests of common sense to the problems of philosophy.

So far as we have the factors and recognize their interdependence, as we do in our comprehension of a proposition, what we know depends on our ignorance of the inseparable unity which makes that proposition true. This may be termed epistemological ignorance. This inseparable concrete unity of subject and predicate, which is the missing correlate of the proposition with distinguished subject and

predicate, is the *given*, which we can never denote. The recognition of the truth of a proposition, in short, is a recognition of our epistemological ignorance of the being of the given as a unity of subject and predicate, making that proposition true.

Nothing, however, can be given unless it is something that could be given. To understand the given, to justify epistemology, we must recognize ontology—the realm of inward, self-subsistent being. We must recognize, in short, a domain of ontological ignorance. Though we do not know the given directly, we feel it. But that which is felt, apart from being felt, is forever beyond us, so long as the given and we are diverse. If the given were not something that could be given, it would cease to be the given and be something which is made in being had. And if the given be real, which it must be if any empirical proposition is true, then the to-be-given must be equally real.

But the given and the to-be-given are correlative and depend one upon the other. The internal unity of these two is the object of metaphysical speculation. It constitutes the ground of whatever is and can be known, a domain to be attained only after the conquest of our epistemological and ontological ignorance. Each such conquest is a loss as well as a gain, for it consists in getting more and more general and abstract formulations of what is more and more concrete. The wisdom of philosophy is summed up in abstractions about concretes which are never had. So far as they make intelligible the domains of common sense, science and art, these abstractions are our most precious bits of knowledge; but as theoretical formulations for which there is no denotable counterpart, they express only our realization of the fact that there is something which we know must be, and be of a certain nature, but with which we can have no direct acquaintance. We all know we are ignorant. It is the use he makes of that knowledge which marks the philosopher.[2]

[2] This paper has been primarily concerned with "intensive" ignorance, the ignorance of the being of a concrete unity from which our singular subjects and predicates have been derived. There is another form of ignorance, the "extensive", whose object is that which lies in another moment of time and at another region of space. This is the ignorance, the object of which is the concern of science. Deny that you know that there is something of which you are ignorant, and not only metaphysics, but science and sanity are at an end. Acknowledge that you know you are ignorant and you have an assertion as basic as any a-rationalist or *a-priorist* could admit. No law of logic is more certain or inescapable than the *truth* that there is something I do not now know. With this admission rabid empiricisms come to an end, pragmatisms reveal themselves to rest on an *a priori*, and phenomenalisms proceed to disgorge their noumena. The more "fallibilistic" a philosophy is, the more tenaciously it holds to the infallible, universal knowledge of extensive and intensive ignorance; while the more dogmatic a philosophy is, the more obviously is it engaged in a speculative account of what one does not directly know. The quarrel between positivists and philosophers is not between defenders and opponents of metaphysics, but between those who do not, and those who do, make evident what it is they

Had philosophers recognized that their proper concern was with objects of ignorance rather than with the fact of knowledge, certain hallowed dogmas would have long ago ceased to have their effect. They would have seen, I think, that epistemology rests on ontology and metaphysics, that the given is not had first, but almost last in knowledge, that all knowledge by acquaintance depends on a knowledge by description and conversely, that there cannot be internal relations without external relations and conversely, that all questions have answers, and that philosophers have nothing to learn from science, except the wisdom of being dispassionate, coöperative and metaphysical.

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PROFESSOR SAVERY'S VIEWS ON PARSIMONY

PROFESSOR WILLIAM SAVERY in a recent paper entitled "Chance and Cosmogony"[1] has taken Occam's razor and the principle of simplicity very seriously. So seriously in fact as to make them appear essential to his metaphysics. Unfortunately so great a confidence in these principles is, I believe, quite unjustified.

Professor Savery supports these principles by a somewhat extended discussion, the conclusions of which he summarizes as follows:

"1. (*a*) that a relevant hypothesis is more probable than an irrelevant one; (*b*) and that a parsimonious hypothesis is more probable than an unparsimonious one. This probability is comparative.

"2. (*a*) that irrelevant hypotheses are improbable to varying degrees; (*b*) that parsimonious hypotheses followed by independent verifications are probable to degrees marked by a sense of presumption. This is simple probability (always, of course, with respect to data or premises)."

I propose to examine in turn the arguments on which Professor Savery bases each of these contentions. In support of his first contention (1*a*) he writes, "If H K is an hypothesis that explains the pertinent facts and laws, and K explains nothing, *i.e.*, if all the explanatory power of H K is due to H, then K is dismissed as superfluous" (151). Now this assertion is so far as I can see quite unobjectionable, but unfortunately for Professor Savery's argument it does not lend the slightest support to the thesis in question. To say that a relevant hypothesis is more probable than an irrelevant is certainly a mistake. It is only in virtue of a proposition's being relevant to its

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cannot avoid admitting. The only question that then remains is whether or not a given metaphysician, positivist or not, is fulfilling his function of intelligently anticipating what he does not yet know.

[1] *The Philosophical Review* XLI 2.

ground that it can have any probability at all. An irrelevant hypothesis has simply no probability at all, and hence cannot be compared in respect of probability with some other proposition. To say that a proposition is not relevant to the grounds adduced is simply to say that, within the limits of the problem as stated, the proposition has no evidence in its favor, and without evidence there can be no probability. The fondness of the French people for Roquefort does not give some tiny probability to the belief that there is shortly to be a great religious revival in the United States. It simply leaves the question exactly where it was before this fact was offered in evidence. Professor Savery continues, "Whatever the antecedent probability of H may be, the probability of H K is less than the probability of H, unless K is a certainty or H has less than a finite probability" (151). If this be taken to mean that, whatever the antecedent probability of H may be, the probability of H K is less than the probability of H, unless K is certain on the evidence H or H has less than a finite probability, then it is in itself unobjectionable, but it is certainly irrelevant to the contention that a relevant hypothesis is more probable than an irrelevant. For what it shows is that H K is less probable than H, whereas what is contended is that K (an irrelevant hypothesis) is less probable than H (a relevant hypothesis).

We may now turn to Professor Savery's argument for contention 1*b*. In support of this thesis he says, "Let us suppose that H implies a given set of facts and laws, and rival hypothesis L M N O P, composed of independent constituents, implies the same facts and laws. If H, by the principle of indifference, is equally probable with, say, L, each being equally specific and simple, then H is accepted as the scientific theory and L M N O P is discarded." Now H is either more probable than or less probable than or equiprobable with L M N O P. If one is more probable than the other the more probable is certainly to be preferred regardless of parsimony. Hence the principle would be of value only if H and L M N O P are equiprobable. We are also told that L is equiprobable with H. It follows therefore that L is equiprobable with L M N O P and this can only be so if the probability of M N O P is unity, which in turn can only be so if the probability of M, N, O and P is in each case unity. Since M, N, O and P are each completely probable it follows that the real choice lies not between H and L M N O P but only between H and L. But by the conditions of the problem H and L were equiprobable and there is, therefore, no rational ground for choice between them. Poincaré is clearly right in his contention that in such a case H is preferred only as a matter of convenience.

Our argument against Professor Savery's first contention is really quite sufficient to refute his third contention (2*a*). For propositions which are non-probable, *i.e.*, which have, not zero probability, but in-

deed no probability at all, do not differ *inter se* with respect to their probability; but it will, I think, be profitable to examine Professor Savery's arguments in greater detail.

He writes, "If K is an idle addition we naturally believe it to be improbable". If by an idle addition Professor Savery means an irrelevant addition then even though we "*naturally believe* it to be improbable" (whether as a matter of fact we do so *naturally believe* or not is a matter of psychology with which I am not concerned) we believe incorrectly; for what we believe without any ground is not improbable but non-probable, *i.e.*, it simply has no probability whatever, for all probability (as Professor Savery himself admits) is relative to some grounds or data (p. 148, lines 1-3).

"Let me make the conjecture that there are seventeen invisible red fairies, no less and no more, now dancing on this table. There is no direct evidence or deductive proof either for or against this delightful hypothesis. We all disbelieve it. Is there any justification for our disbelief?"

Here what Professor Savery seems to be asking for is the ground upon which we disbelieve the proposition, "There are seventeen invisible red fairies, no less and no more, now dancing on this table". To which my answer is quite simply that there is no ground. Since there is no relevant evidence either for or against this proposition, it should be clear that there is no more reason for disbelieving it than for believing it. To believe or to disbelieve a mere supposition such as this is to act irrationally, for it is to believe a proposition for which there is no ground. The rational attitude toward a supposition is that of doubt.

Professor Savery, however, despite his admission that there is no relevant evidence for the proposition, nevertheless endeavors to show its improbability by the following argument. "Let us make the hypothesis, then, that there are red fairies dancing upon the table. . . . I know of no way of revealing an improbability except by appealing to the principle of indifference. . . . Let us ask the widest of all relevant questions. What is the probability of anything supernatural but connected in some way with any part of space-time? I know no evidence for the hypothesis or against it, so I will put the probability at one-half. . . . What is the probability of something supernatural connected with this galaxy? Very much less. And so on down to the table. What is the probability of a supernatural being on the table being similar to an animal? And so on down through the zoological classification until we arrive at creatures who resemble man. From being similar to man we must pass to fairies and from fairies to red fairies. With every addition of a specific difference we lessen the probability. The commonsense view is justified. . . . With every addition of an independent hypothesis we lessen the probability."

This argument rests avowedly upon the principle of indifference.

But Keynes has asserted that "it is a necessary condition for the application of the principle, that these [*i.e.*, the alternative hypotheses] should be, *relatively to the evidence*, indivisible alternatives of the form Φ(X)" (*Treatise on Probability* 60. My italics.). That two hypotheses can be equiprobable only in respect to evidence follows necessarily from Keynes' dictum that all probability is relative to some ground, a view which Professor Savery not only unequivocally asserts that he holds, but concerning which he also says that "This is now a commonplace" (*The Philosophical Review*, p. 148, line 3). It is clearly inconsistent of Professor Savery to hold this view of the nature of probability and also to hold, as he seems to do, that the principle of indifference applies to completely ungrounded hypotheses. But even if this objection be waived his argument is nevertheless invalid, for Keynes has shown that "the Principle of Indifference is not applicable to a pair of alternatives, if we know that either of them is capable of being further split up into a pair of possible, but incompatible alternatives of the same form as the original pair" (*Treatise* 61), and Professor Savery's argument violates this condition at every stage. Take for example the first two alternatives with which he starts, namely (1) there exists something supernatural connected with space-time, and (2) there exists nothing supernatural connected with space-time. The first is clearly capable of being split up into a pair of incompatible alternatives. Indeed it is essential to Professor Savery's reasoning that it should be, for otherwise successive applications of the principle of indifference would not be possible. Professor Savery selects as alternatives under (1): (*a*) there exists something supernatural in our galaxy, (*b*) there exists nothing supernatural in our galaxy. Professor Savery's argument depends on successive applications of the principle of indifference; but for him the condition for successive application of the principle is that one (at least) of the alternatives should itself be capable of being split into alternatives, which, as Keynes has shown, is precisely the condition that makes the application of the principle of indifference invalid. We are therefore bound to conclude that not only this argument, but all arguments of this type, are essentially invalid.

Professor Savery's conclusion that "the superfluous hypothesis K is improbable (assuming it is a pure invention of the world of theory) in a degree proportioned to its specificity and to its aggregation", is therefore to be unhesitatingly rejected.

We have now to consider Professor Savery's final contention (2*b*). A comparative probability of H and L M N O P such as Professor Savery believes himself to have shown is, he thinks, not sufficient. "We need", he says, "a simple probability in favor of H and an improbability against L M N O P." "The simple probability in favor of H is more difficult to determine [than the relative probability] be-

cause we may have as possible rivals a number of other hypotheses still unthought of. The principle here seems to be the same as in Nicod's conclusion about possible laws. If we may start with any finite probability, however small, in favor if H, this probability will increase indefinitely with its verification by each new independent law that it explains. There are then two difficulties: first, the assurance of the finite probability at the beginning, and, second, the determination of the degrees of probability attained by verification, including such questions as: When does the probability exceed, say, one-half, or, when does it greatly exceed one-half, or, when does it become overwhelming?"

"As for the first difficulty, I might try the following suggestion. The possible hypotheses are either finite in number or infinite. If they are finite we may symbolize the number by N. I do not see why there should not be an infinite number of possible hypotheses to explain a law, but neither do I see why there should be a finite[2] number. My ignorance is complete. With the principle of indifference then I have no reason to suppose that the probability for an infinite number of hypotheses is greater than for a finite number. Let us then put the probability that there are a finite number of hypotheses as one-half. It follows that any one hypothesis has an antecedent probability of $\frac{1}{2}N$, or, strictly $\frac{1}{2}N + 1/\infty$. This, then, is the initial finite probability of H."

This solution is not only, as Professor Savery admits, "not very satisfactory", but clearly fallacious. The principle of indifference, as we have already noted, is *not* applicable in cases where there is no evidence, or where one of the alternatives may itself be split into alternatives of the same form. Hence it is not applicable in the foregoing argument, to which it is nevertheless essential, inasmuch as (1) by hypothesis neither alternative has any evidence in its favor and (2) the alternative that there are a finite number of possible hypotheses may be split for instance into (*a*) "The number of possible hypotheses is greater than one hundred" and (*b*) "The number of possible hypotheses is less than one hundred".

Having established, as he supposes, the four theses with which this paper has been concerned, Professor Savery, using them as premises, proceeds to argue that realism is more probable than idealism, that concatenism is more probable than monism, and that Platonic Ideas and primary matter are chimerical. Whether these conclusions do as a matter of fact follow from Professor Savery's theses is a question which we need not pursue, since we have already seen that the theses themselves are false.

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[2] The text reads "an infinite", which I take as a typographical error.

REVIEWS OF BOOKS

Contemporary Idealism in America. Edited by CLIFFORD BARRETT. New York, The Macmillan Company, 1932. Pp. x, 326.

Professor Barrett is to be congratulated on the team he has brought together to play the game of Idealism in twelve essays in honor of Josiah Royce. The book is a witness to the vitality of the great tradition of which Royce may be said to have been the chief representative in America during the closing years of last century and the beginning of this. After a charming dedicatory chapter by George Herbert Palmer the contents consist of an Introduction by the Editor, followed by essays on the "Continuity of the Idealist Tradition" by Charles M. Bakewell; "The Ontological Argument in Royce and Others" by William Ernest Hocking; "On the Meaning Situation" by G. Watts Cunningham; "The Philosophy of Spirit: Idealism and the Philosophy of Value" by Wilbur M. Urban; "The Principle of Individuality and Value" by Joseph Alexander Leighton; "The Finite Self" by Edgar Sheffield Brightman; "God and Cosmic Structure" by John Elof Boodin; "The Theory of Moral Value" by Radoslav A. Tsanoff; "The Meaning of Obligation" by Charles W. Hendel; "The Revival of Idealism" by R. F. Alfred Hoernlé. The last adds to his title "in the United States." But, as will be seen from this list, the United States has been interpreted in a liberal way which is typical of the hospitable spirit which is so marked a feature of the whole. Within the prescribed limits it is impossible to give even the barest outline of the contents of the several essays. There is none of them that does not repay study, whether as presenting in a fresh and condensed form views that the writers have elsewhere developed in full, or as fresh developments of particular doctrines. It is with all the more regret that I find myself obliged to make a somewhat arbitrary selection of those which deal with problems which particularly interest myself, with a view to indicating the contribution which they seem to me to make to their solution.

Taking these in their order in the book, there is none I think which would have delighted Royce's heart more than Professor Hocking's singularly fresh treatment of the Ontological Argument from the point of view of the relation between essence and existence, on which the Argument, when properly stated, depends for its validity. His position may be summed up in the two statements: "The essence world is such that it must exist"[1] (58) and "the essence of God must be real, because it is an essence inseparable from my continuous consciousness or experience of reality" (65). The only question that remains is the old one whether the essence and existence that are here proved are

[1] Pity that the point is blunted by the printer's error of the commas.

those of which the religious heart has, in all these ages, been in search. It is perhaps significant in this connection that, as Royce himself came to be more deeply immersed in the religious problem, the conception of the Absolute tended to be replaced by that of the Beloved Community.

Professor Cunningham's essay on the meaning of Meaning takes up a subject in which Royce may be said to have been a pioneer, but he carries the analysis a good deal further than Royce anywhere did. After distinguishing five types of meaning-situation, he goes on to analyse the situation itself into its components of that which means, namely mind, and that which is meant; again distinguishing the latter into the two elements of "content" and "object". Finally in a third part he discusses the status and relation of these three constituents to one another, arriving at the conclusion (which again would have delighted Royce) that "the meaning situation is a system which is a relationship between two systems through the mediating function of a third system". He explains, however, that "the third system is not a third thing, but part of the system of mind". He disowns the purpose of finding, in his argument for the ingression of mind into all meaning situations, a short way with realists. But he does not pursue the subject by dealing with the obvious objections which the realist who knew his business would not be slow to bring, and one cannot help feeling that something more is needed to show the precise connection between his results and a way, short or long, with Realism. In another respect one would have welcomed further light. One of his types of meaning-situation is valuation, and he raises the question of the equivalence of meaning and value, but puts it aside as beyond the scope of his essay.

On both these problems Professor Urban's paper is a welcome continuation of the argument. It seeks to prove (1) that meanings presuppose values; (2) that the existence of values in the world implies "some kind" of mental life; (3) that the only kind that meets the situation is that best named spirit; (4) that the values which it is the essence of spirit to acknowledge may be used as the Theseus Thread to carry us both lower in the scale of reality than human consciousness and also higher to an Absolute or Totality whose principle is value. Of particular interest in this connection is his criticism of Whitehead's Philosophy of Organism as a movement towards the same position. One of the most interesting points indeed in the book is the difference between the views of Urban and of Hoernlé upon this. While the former holds that a further transformation of Whitehead's scheme is required to bring it into line with a true Idealism, the latter seems to think that the transformation has to be effected from the side of Idealism.

Leaving this for the moment, and taking Professor Hendel's essay

on Obligation, the reader is in some danger of overlooking the significance of its contention owing to the perhaps excessive length of the historical part. The philosophical interest of the essay centres in his treatment of the idea of the General Will both in its origin and in what he conceives of as its ultimate fate in the hands of Kant. After the idea had played a conspicuous part in Rousseau as the ground of obligation, Kant's service consisted in dropping it out and leaving respect for law pure and simple in the seat of authority, as "the most significant idea in modern ethics, without which we could not express to ourselves the ideal meaning which life seems to have". With regard to this proposal for a "return to Kant" what gives the reviewer, as an impenitent believer in the reality of the general will when properly interpreted, hope that perhaps he is not so far apart from the writer is that after expelling it from its place in earthly society (as he thinks, with the authority of Kant) he yet finds it necessary in order to complete the picture to reintroduce what looks uncommonly like it in the idea of a "cosmic republic of immortal souls of virtuous men" in another world.

I have already referred to Professor Hoernlé's essay as going even further than Urban in tracing the deep affinity between Whitehead's thought and that of F. H. Bradley. He also goes further in welcoming even Dewey into the fold of an absolute Idealism, on the ground of some of his utterances which he finds more in the spirit of his early studies of the great idealists than of the views commonly attributed to him by would-be disciples. "Indeed", as he finely concludes, in a sentence that might well have been taken as a motto for the whole book, "one of the main interests of contemporary philosophy is just the way in which, from a common basis in experience as ultimate, a variety of theoretic paths can be pursued to the common aim of a deeper understanding of the Universe and man's place in it." Returning in the last section to what every intelligent reader of the book will have felt before the end to be the main problem raised by it, viz., that of the metaphysical status to be assigned to Personality, he thinks that he finds the lines on which a solution will be found in Whitehead's Philosophy of Organism, which seems to him to "make the old difficulties drop out of sight by the new pattern in which he arranges familiar elements". To most readers this will be apt to seem a hard saying. If old difficulties drop out in Whitehead, there are lots of new ones to take their place. But perhaps an idealistic synthesis is a more difficult thing to achieve than is sometimes thought, and if the result of this book is to stimulate the younger men both in America and in England to a more resolute effort to achieve it in the light of fuller knowledge, there could be no better tribute to the memory of the distinguished philosopher to whom it is dedicated.

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Nicolai de Cusa opera omnia. Vol. I. De docta ignorantia. Ediderunt Ernestus Hoffmann et Raymundus Klibansky. Vol. II. Apologia doctae ignorantiae. Edidit Raymundus Klibansky. Lipsiae, Felix Meiner, 1932. Pp. xx, 180; xii, 50.

Great and growing as is the Cusan's place in the history of thought, his writings have for centuries been rare, and scholars have sighed in vain for a complete and a correct edition. That of Lefèvre d'Étaples in 1514 was learned, indeed, and sought completeness. In its behalf, and for the greater glory of Germany, Beatus Rhenanus besought the aid of all the German humanists, and not in vain. But not all it sought was found, and what it had it corrected too freely. Alas, too, it was sumptuous and costly. Before 1540 Calcagnini at Ferrara, maintaining the earth's motion, could mention Cusa, but could not find his writings. The Basel edition of 1565 reached a wider circle; but its errors were innumerable, and soon it too was rare. An Italian attempt of 1913 was a fiasco.

But at last, a half-dozen years ago, the Heidelberg Academy faced the task of a truly critical edition. Its representatives of philosophy and church history joined hands with those of mathematics and natural science for the enterprise, and again the help of all Germany was enlisted. The leadership fell to the philosopher Ernst Hoffmann and to his assistant Raymond Klibansky, a young scholar whose aid had already been used by Cassirer in that study of *Individuum und Kosmos in der Philosophie der Renaissance* (1927) which gives such space to Cusanus. By 1928 the Academy could outline the plan in its *Jahresheft*, and every succeeding year has brought tidings of its progress. First to be printed are the philosophical and the politico-ecclesiastical writings, and they will fill fourteen volumes of some 1600 pages in all. It is hoped that all can be off the press by 1939. Two volumes in handsome quarto, the *De docta ignorantia*, Cusa's leading philosophical work, and his *Apologia* therefor, now lie before us and do their editors all honor. How successful has been their quest for MSS. one sees by comparing the long list in their preface with that given in 1920 by the learned monograph (*Le cardinal Nicolas de Cues*) of Vansteenberghe—a scholar whose cooperation is also assured. With the aid of these they have labored not only to restore the text, but to show as fully as possible the author's precise debt to earlier writers and that of his successors to him.

Next to appear will be the *De visione Dei*, also at the hands of Hoffmann and Klibansky; the *Idiota*, edited by Baur of Breslau; and the *De concordantia catholica*, which Kallen of Cologne, already known by an edition of this work, has now in hand. Meanwhile, however, the enterprise is being supplemented, in the *Sitzungsberichte* of the Academy, by a series of *Cusanus-Texte*, initiated in 1929 with a sermon

of Cusa that helps to interpret the *De docta ignorantia*, and a series of *Cusanus-Studien*, begun in 1930 with one by Hoffmann on "the universe of Nicholas of Cusa", not to mention collateral studies like that of Klibansky in 1929 on a Proclus MS. whose marginalia by Cusa's own hand throw a flood of light on that thinker's Platonism. Separates of these can, of course, be had from the publisher, Carl Winter of Heidelberg; but it is clear that whoever will keep abreast of the new Cusanus must follow with care the Academy's proceedings.

GEORGE L. BURR

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The Physical Significance of the Quantum Theory. By F. A. LINDEMANN. Oxford University Press, 1932. Pp. viii, 148.

The Open World. By HERMANN WEYL. New Haven, Yale University Press, 1932. Pp. vii, 84.

The object of Professor Lindemann's book is to resolve some of the difficulties in the quantum theory, not by producing fresh experimental evidence in favor of a special theory, but by a fresh analysis of some of the concepts employed in this field. Although written by a professional physicist for other technicians, it deserves the careful attention of philosophic students of science.

It is well known that contemporary physics employs a corpuscular theory of light in order to explain the localized concentration of electronic energy, while a wave theory is invoked to account for the distribution of the corpuscles. The net outcome of these tactics is to leave the physicist with bare formulae, which succeed in unifying the details of quantum phenomena, but which leave discontented those who demand a consistent physical (or intuitive) picture of the subatomic mechanism. Professor Lindemann thinks such a picture is possible if we take seriously the fact that the laws of atomic structure represent statistical averages and if we recognize that conceptions adequate for macroscopic levels lead us astray when applied to microscopic phenomena. They lead us astray because the *procedures* employed in one case, and which constitute the very *meaning* of the concepts, become significantly altered in the other case. More specifically, the effect of a measuring process upon macroscopic objects is negligible; it is not negligible in measuring electrons. Thus, while the coordinates of position can be accurately determined for large-scale objects, it is meaningless to ask for the absolutely determinate spatial positions of subatomic objects. We cannot therefore neglect the dynamic coordinates (the momenta) in studying electrons, or overlook the indetermination in their positions because of the influence of the measuring instruments upon them. On Professor Lindemann's view, electrons are corpuscles, not waves, and the phenomena usually interpreted in terms of a wave theory must be considered in the light of the *intrinsic indetermination*

in their position. By taking the "uncertainty principle" as central to the understanding of electronic behavior, he shows with great skill how the three alternative theories of the quantum (associated respectively with the names of Bohr, Heisenberg, and Schrödinger) are simply different ways of reinstating the illegitimately neglected dynamical coordinates. Thus Professor Lindemann gives an illuminating illustration of the manner in which a serious difficulty is resolved by universalizing it, so that a trait of a subject matter which causes perplexities when it is thought to characterize only a limited portion of it, ceases to be perplexing when it is seen to be commensurate with all of it.

It will be clear, even from this brief summary, that Professor Lindemann is committed to the "operational" theory of meaning. Propositions about distances between corpuscles are verifiable, and therefore meaningful, if it is theoretically possible to measure the distances involved. Hence no operational meaning, and so no meaning which concerns the physicist, can be attached to the phrase "the absolutely determinate position of an electron". For subatomic "distance" is a statistical concept, and the operations involved forbid the separation of the kinematics from the dynamics of electrons. Consequently, questions concerning the applicability of principles of causality or uniformity to the behavior of electrons, or the distance between nucleus and electron, must be dismissed as without physical sense.

There is little hope for clarity in the fundamentals of the sciences, until the operational meaning of the ideas employed is systematically explored. Students should be grateful to Professor Lindemann for the quality of the analysis he has undertaken. Their quarrel with him should be that he has barely touched the surface of the matter, and that he has not seriously faced the problem of the connection between the procedures of measurement in the macroscopic realm and the subatomic particles whose behavior these procedures are intended to measure. It is also regretable that he has not always remained faithful to the principles of his method. Thus, he is willing to indulge in speculation about the possibility of discovering the principle of life within the regions of indetermination in atoms—regions concerning which nothing meaningful can be said.

Professor Weyl's book, which constitutes his lectures on the Terry Foundation, is unfortunately of a different sort. It is concerned with speculative metaphysics rather than with analysis, so that his great gifts as a mathematician have little chance to be exhibited at their best. The thesis developed is that the philosophic and religious mind is "open" or directed to the intuitive grasp of the Infinite or God, but since the Infinite can not be intuitively apprehended, we make for ourselves a progressively more complete symbolical construction of

it. Such a construction is most adequately achieved in the theories of the natural sciences, since in them, according to Professor Weyl, the duality between the ego as subject and the presented world as object is transcended. While in history and morals we have not yet succeeded in raising the veil with which our human nature covers the essence of things, "in our knowledge of physical nature we have penetrated so far that we can obtain a vision of the flawless harmony which is in conformity with sublime reason".

Upon the thread of the contrast between knowledge which is intuitively clear or immediate and knowledge which is discursive or symbolic, Professor Weyl hangs all his discussion of God, the universe, causality, and infinity. The uncritical character of his approach is most clearly shown in his suggestion that the Pauli exclusion principle is ground for supposing there is a "non-causal understanding" between electrons, and that the quantum theory may bridge the gap between the organic and inorganic. It is very instructive to compare this discussion of the Pauli principle with that of Professor Lindemann, who shows clearly, in terms of the operational significance of the principle, that such mystifying speculations make no sense. A strong Fichtean flavor runs through this as through all of Professor Weyl's philosophic writings. He declares that since the objective sphere with which science deals is impervious to reason and the clear intuition of essence, action is required. "Even in pure mathematics, or in pure logic, we cannot decide the validity of a formula by means of descriptive characteristics. We must resort to action: we start from the axioms and apply the practical rules of conclusion in arbitrarily frequent repetition and combination. . . . Truth must be attained by action".

In spite of Professor Weyl's great erudition and sensitiveness to the history of philosophy, any one interested in the clarification of scientific ideas, rather than in the irrelevant uses to which they may be put in ethics and religion, will find nothing in this book.

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Theoretische Biologie. I. Band: Allgemeine Theorie, Physikochimie, Aufbau und Entwicklung des Organismus. Von LUDWIG v. BERTALANFFY. Berlin, Gebrueder Borntraeger, 1932. Pp. xii, 352.

This first volume of Dr. Bertalanffy's ambitious and scholarly effort to lay securely the foundations of an autonomous science of theoretical biology offers the patient reader a laborious compilation of theoretical results claimed by recent researches in the special branches as well as the general field of biology. The need for such a theoretical work arises from the rapidly increasing number of experimental results whose interconnection threatens to disappear from sight in the

absence of any systematic attempt to make explicit the pervasive features of all organic phenomena. It is surely an enormously difficult task not only to find the concepts common to such divergent data as the physico-chemical synthesis of organic compounds and the complex factors of heredity, but also to analyze the numerous rival theories of the constitution and properties of protoplasm throughout the various phases of cellular metabolism and reproduction.

There is both a positive experimental and a more general logical aspect to such a problem, and Dr. Bertalanffy has not hesitated to deal with both. He conceives the relationship between the natural science of biology and its philosophical assumptions partly along phenomenological and partly along neo-positivist lines. Yet to the reviewer the concessions to living *Gestalt* hardly seem compatible with the approach of Reichenbach's *Ziele und Wege der heutigen Naturphilosophie* which emphasizes rigorous conceptual analysis, reducibility of all natural law to statistical, physical terms, and the elimination of all non-operational or non-verifiable entities such as the "entelechy" or purpose that vitalists postulate.

The traditional controversy of mechanism and vitalism naturally receives much space. The issue is well stated in terms of the differences in methodology that would be entailed by adopting either viewpoint. For some unaccountable reason the author rejects any method that might deprive biology of the peculiar autonomy he thinks it should have. Yet he wishes to restrict biology to "what is observable and verifiable in living organisms as things of the outer world in space". The "inner" world belongs to psychology, on this view, but we are left in the dark as to the possible basis for such separate worlds.

The mechanistic position is analyzed and criticized by distinguishing rather roughly five distinct meanings of the term "mechanism", and then showing the inadequacy of each from the "organismic" standpoint of the author. Mechanism means: (1) "explanation from the principles of mechanics in the sense of Newton and Herz". Obviously not even a physicist any longer accepts this sort of mechanism. (2) Mechanism means any "physico-chemical explanation" as opposed to a "specifically biological" one. The reviewer has not succeeded in understanding what such specificity could be in discursive terms, for there seems to be no escape from the dilemma created by Dr. Bertalanffy's opposition of physico-chemical law to the specifically biological concept of organism. Living things are understandable either in terms of a verifiable analysis (which physical science does afford) or in terms of the specific wholeness (*Gesamtheit*) of living phenomena whose properties are not capable of verification by physical means. By rejecting the first horn of the dilemma, Dr. Bertalanffy finds himself

confronted with the contradictory alternative of constructing a theory of "organismic behavior" in which the physical behavior but not the wholeness is capable of verification.

The fundamental concept of "organism" is defined as an "hierarchical ordering of a great number of different parts of an organized system whose processes lead to the construction of the material and energy required to preserve the system or to produce similar systems" (83). Surely energy is a physical concept.

Mechanism means (3) what can be explained on the analogy of the machine. This seventeenth century metaphor is ably criticized by the author in terms of the more general notion of "system". But the vitalist can gain little comfort from this criticism insofar as his own notion of an efficacious "entelechy" also vanishes in the logical structure of a system that characterizes life.

Mechanism means (4) strict determinism in traditional scientific logic, but this meaning must be rejected from the logic of modern statistical physics. Yet the necessity inherent in the internal development of the vitalistic entelechy must also go into the discard of necessary existential propositions.

Finally, (5) mechanism is often regarded as an immanent principle restricting the explanation of spatio-temporal phenomena to objective spatio-temporal causes. While there is some methodological value to this positivistic meaning, no number of such physico-chemical summations could yield the historico-structural wholeness which the author seeks as the specifically biological.

Thus the organismic theory is a valorous attempt to mediate between dogmatic mechanism and vitalism and capture the will o' the wisp which he calls the "organismic" or specifically biological. To postulate the concept of organism as having the same central rôle in biology as energy in physics is to forget that the latter is not a specifying or individuating term. Its meaning is given by the equations in which it is used as a functional correlator of measurable relations. Until the same can be said of "organism" we ought not be too sanguine about the possibility of an autonomous science of the living as sharply distinct from the non-living, physical world. Dr. Bertalanffy's own organismic theory relies so heavily on such physical notions as dynamic equilibrium, conservation of system, statistics of higher orders of organization, probabilities of cross-combinations, that little remains for the organismic except the purely logical function of systematic presentation of principles not yet reduced to physical relations. A more adequate historical survey of neo-Platonic theories of the vital world-soul (especially in the Renaissance era) would have added to Dr. Bertalanffy's argument that the older vitalism is logically reducible to the same rigid determinism as the older mechanism.

The main value of this compendious digest of recent biological literature is to impress upon the philosophical reader the need for critical and rigorous analyses of all attempts to synthesize the wide diversity of experimental results in biological research. Such critical work is facilitated by attempts like Professor Woodger's to present biological theory in logistic form. The bibliography of Dr. Bertalanffy's treatise is extensive in true German fashion and includes nearly all the articles and books published on biological theory in the last decade. Two important omissions, however, are Lotka's *Physical Biology* and Loeb's more theoretical papers, both of these biologists having presented the case rather strongly for modern mechanism.

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Der Wertgedanke in der Europäischen Geistesentwicklung. I. Teil: Altertum und Mittelalter. Von FRITZ JOACHIM VON RINTELEN. Halle, Max Niemeyer, 1932. Pp. xx, 304.

This is the first volume of a comprehensive work dealing both historically and systematically with the philosophical problem of value. The author champions a thoroughly realistic theory of value, as a quality of being independent of the evaluing subject, nay more, as the ultimate ground and meaning of history and the world-process. He combats vigorously the relativism of our times and insists that there are principles of value of universal validity, capable of being intuitively apprehended, conceptually formulated, and rationally embraced as ends of human activity. He refuses, however, to locate these eternally valid norms of value in an unreal world of mere validity, in the fashion of the neo-Kantians; for to do so is to jeopardize all concrete realizations of value, as being relative and therefore worthless. Besides, the *a priori* valid norms of the neo-Kantian school are too empty to do justice to the uniqueness and richness of concrete reality. The philosophy of value, therefore, must essay the difficult task of putting in conceptually valid form the value contents of historical individuals, avoiding both an ineffectually abstract formulation of the good, and a pessimistic denial of objective principles. How successfully his philosophy avoids these difficulties can only be judged when the systematic part is before us.

When we ask what concrete values the author thinks have eternal validity, we are told that our age need not look for *lux ex oriente,* but must endeavor to revive and relive the values of the European Christian tradition. We must transcend the utilitarian intellectualism and the humanitarian levelling of the last centuries; we must move from civilization to culture. The historical survey of theories of value seems to be carefully done, with special (perhaps a dispropor-

tionate) emphasis upon the views of medieval thinkers. It is hard to believe that the contribution of the Middle Ages to our knowledge of values is three times as great as that of classical antiquity. And it may well be asked whether a history of philosophical theories about value is as important to a serious seeker after eternal values as this author thinks. But the historian of philosophy may have reason to be glad that the author has produced so able and thorough a treatment of medieval thought on this subject.

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La critique et la religion chez David Hume. Par ANDRÉ LEROY. Paris, Félix Alcan, 1931, Pp. xx, 378.

This book is a fine and very adequate treatment of its subject. The author is in accord with those who regard Hume's critical thought as centered about the question of religion, and he develops farther than anyone has yet done the position which is a consequence of that point of view. "All the rest of this work will show that Hume was very specially preoccupied with the religious problem; for that orientation of thought, two causes can be assigned, one peculiar to Hume which the preceding pages have tried to show in its full value—that at the moment when Hume was studying, the mode was one of religious controversy—the other general, that the religious problem is, in the last analysis, the sole philosophical problem, and the solution we give to it decides all other particular solutions" (204). And this book thus becomes an interpretation of the philosophy of Hume as a whole.

The first chapter, which represents an exemplary piece of historical study, deals with the influences making for that religious "orientation of thought". We are shown what it was Hume assimilated in his "studious adolescence", the ideas, the attitudes, the interests, and the habits of critical discussion. A certain concordance is observed in the effects of the various writings he had studied, which discloses his thought already in some kind of formation, though only expressed, as it were, in the choice of his reading. Cicero with his Academic method of reasoning; Lucretius and his "Epicurean hypothesis"; Plutarch, agnostic in regard to reason, yet talking naïvely about an intuition of the divine; Montaigne who dwelt on the vanity of reason and nevertheless spoke, apparently without any dishonesty, as if faith or revelation might have some meaning; Bayle (very deservedly receiving most attention from the author) who possessed a most seductive "dialectical virtuosity", who expounded both demonstrations of God and reasonings of an "experimental" nature, who dexterously weighed alternative hypotheses, and particularly that of Strato which attributed order eternally to nature and thus posited the very uniform-

ity for nature which all empirical reasoning presupposes; and yet who argued, too, that this very order, especially in organic systems, seemed unintelligible without the theistic hypothesis of an intelligent author—thus Bayle made his points *pro* and *con*, and in sum, established at least this, that human reason is inconclusive and only by revelation can one make a decision. M. Leroy felicitously recalls how germane to these questions were the ideas of Lucian whose pleasantries Hume never ceased to enjoy. It is further shown what attracted Hume in Fontenelle, his "scientific rigour and elegance"; and in Fénelon, his skill in "abstract dialectic" with the ontological argument and against the notion of matter having intrinsic forces of organisation. By all these divers influences the youthful Hume was made to be critical, and critical not only of theism but also of a materialism which went beyond the experimental reasoning and attributed powers to matter and talked about "necessity" as if it were entirely intelligible to the mind of man. Hume the critic was thus formed, a person even more thoroughly sceptical than those who gave him his first lessons in scepticism (61).

But there was also an outer environment conspiring toward such an "orientation", those religious controversies where the argument was between "orthodox rationalism and deistic rationalism". At the start M. Leroy points to the presence in England of something different from the rationalism of the time, that among the bourgeois there existed "a veritable appetite for mysticism" (63). For these people had a "very lively feeling about morality and they confounded the essential propositions of religion with moral prescriptions. Thus is explained why the English moralists of the eighteenth century all seek the principle of morality in affectivity; thus is also explained the fact that classicism and rationalism will give place very rapidly to a renaissance of sentiment; thus is explained the extent and depth of the religious awakening of 1740; all affectivity was not dead in the generality of minds" (64). Thus there was a native ground for criticism of rationalism. But it had to have its day first with the flood-tide of interest in "natural philosophy", and it gained expression both in philosophy and in deism. The rise and development of this rationalism is finely delineated by M. Leroy. He observes well that the early deism of Herbert of Cherbury was at bottom simply an expression of moral creed. "This moralism could not yet outrage the bourgeois of that epoch, who had a tendency themselves to consider morality as the essence of religion. But soon there formed some kind of original combination of the critical temper, the deterministic attitude of science, and that moralism which was an enemy to all external ritual; and to this were added polemic ardor and personal quarrels. . . . Hume lived through all these polemics . . ." (73 f.). The salient figures in the coming argument were Shaftesbury, Toland, "the most perfect type of

English free-thinker in the eighteenth century" (100); Collins, charged with "the polemic instinct" (104); Clarke who really led to agnosticism, and Wollaston, Derham, Leslie, Sherlock, Tindal, Butler, and Berkeley. Incidentally the author makes very much more of William Derham than did Leslie Stephen in his *English Thought in the Eighteenth Century:* "Here [in the *Physico-Theology*] Derham sketches a pragmatism of sense knowledge which represents and develops a French author certainly known to Hume because of his renown, Abbé Pluche, author of the *Spectacle of Nature*. Our knowledge has been adapted by God to our activity; it does not permit us to attain the foundations of things, but it suffices for the needs of life" (142). Now this doctrine was very far from being peculiar to Pluche and Derham; it had been expressed earlier by one of great influence in French thought, Malebranche, the magic of whose fancy most certainly touched Hume in his youth. The disregard of Malebranche here and in the later treatment of the doctrine of imagination is the sole omission which one can criticise in the historical part of the work.

At the conclusion of this chapter there is a masterly statement of the critic's function: "If it is proper, however, to explain in a certain measure the philosophy of Hume by its relations to prior doctrines, one must not go to the extreme, and make of that philosophy a kind of mosaic composed of things derived from without; one would be led to refuse originality to all thinkers, who necessarily form themselves by study of the doctrines held in esteem in their own epoch; it is not even the case that certain problems impose themselves at a determinate epoch, but rather a certain manner of posing the problems; the personality of a philosopher reveals itself in the way in which he systematizes the diverse questions, in the directive idea which gives all the value to the particular solutions; it is that vision of the whole which one must needs rediscover with Hume, that essential conception which a veritable philosopher often lives and utilizes without fully knowing it, that conception, indeed, without which a writer is nothing but a very clever man, an expert and seductive mosaicist" (199). How Hume came to his own distinctive thought is suggested: "The orthodox and the deists both supported themselves by reason, and yet they could not bring themselves to any agreement; the camp of the deists is itself divided into two groups. . . . These three groups are otherwise not clearly delimited from each other; they have relations to each other through transitional forms and they are distinguished only in their clearest forms. Those interested in science interdict reason's passing beyond science and the mechanism of the phenomenal world; the moralists proclaim that reality is essentially rational and good . . .; intermediate thinkers, carried on by their moralism or restrained by

their good sense and their religious respect, finish by deciding for an inconsistent anthropomorphism which, the moment one presses it, vanishes in more or less complete agnosticism. These three essential tendencies are symbolized in the *Dialogues on Natural Religion* by Philo, Cleanthes, and Demea. These personages are not portraits of certain philosophers contemporary with Hume; they are types, more simple, more coherent, and more logical than the philosophers from whom they drew their traits" (199 ff.) And Hume, envisaging that situation, found his work before him: "It is necessary to take the problem up again from the very beginning, to define human reason and delimit its domain. Such is the design of Hume in his *Treatise on Human Nature*."

The second chapter is an excellent systematic study: Part 1 on "The Theory of Knowledge"; Part 2 on "The Critique of Religious Rationalism"; Part 3 on "The Moral and Religious Conventionalism". The author restates a constructive view which is being increasingly adopted, that for Hume the imagination appeared to be the important factor in human knowledge. "Essentially the imagination is a tendency to continue a course of thought sketched under the action of experience; it is a power of unification and systematization; it introduces into the internal world more regularity than we can ascertain in it.... It is also a tendency to exteriorization, to the objectivation of our sentiments; it is the imagination that transports into the phenomena the necessity of causal relations; it is this tendency which projects, like phantoms, our own sensible qualities in the external world so that we are made to see bodies in a picturesque manner. In brief, the imagination is the principle of all mental life" (216 f.). "Experimental science has its value from its rigor and precision and not from the fact that it brings into play any faculties superior to the imagination. To reason correctly is to give to objects the relations they have in experience. As to the final nature of reason, of experimental reasoning, we can say nothing; it is an original quality which certainly affiliates itself with habit; but habit and reason translate the nature peculiar to the mind, and we cannot go any farther" (224). "In short, the human mind utilizes but one process when it reasons about facts, analogy; but when the analogy is great between the present and the past, when it is almost equivalent to an identity, we give to reasoning by analogy the name of causal reasoning; when the analogy is weak and practically vanishing, our conclusions are uncertain and if we do not attend to the extreme weakness of their probability, we fall into prejudices. One passes thus by an insensible gradation from prejudices to scientific conclusions. The fact of the matter is that we are simply being disposed to this by an essential faculty of the imagination which by its nature affiliates itself with habit and tends spontaneously to report

the past in the present" (242). "Reason or understanding or imagination—the name is of little import—is I know not what in us that is capable of taking on habits under the action of sensible phenomena, of education or of the passions . . . So experimental science is composed of human conventions which regulate themselves as much as possible on the phenomenal reality but present always a human translation of it. That conclusion Hume does not explicitly present here, but as the subsequent analyses prove, all his philosophy is essentially a conventionalism" (245).

But this must be shown through a part treating of his "Critique of Religious Rationalism". In the *Dialogues* the argument from final causes is said to be handled with superb mastery: "That perfection of form clearly manifests the attention given by Hume to the examination of the religious problem; it supposes not only extensive information but constant reflection to bring to light the essential points of the argument" (272). The twelfth and last Dialogue, however, poses a problem of interpretation as to whether Hume was sincere in allowing an affirmative belief. Was he not, perhaps, merely using a literary device, as others had frequently done before him? The same apparent trick was employed at the end of his essay on Immortality, and again at the conclusion of the essay on Miracles, which A. E. Taylor seems to think is "wilful persiflage". But what did Hume mean by his "renunciation of criticism" at the end of these various works? Did he "really feel the inquietude of the divine" and desire an express revelation without, however, believing that it was possible? What could he possibly mean by "revelation"? M. Leroy defers the final decision as regards the *Dialogues* but recalls how early the essay on *Miracles* was written, and also, what some of the authors figuring in Hume's studious youth had impressed on him—such men as Leslie and Sherlock, and possibly the remoter figures of Montaigne, Plutarch, and Cicero—that there might be an "internal miracle". So Hume could well have been perfectly sincere and he would probably have explained himself as follows: "While recognising the possibility of the miracle, I find in experience that it is impossible practically to distinguish by external appearances a true miracle from a deception; . . . the sole miracle of which one could be certain is the internal miracle; it is the immediate knowledge of the divine presence, although I have never yet experienced it. I know it only by hearsay, so I can neither deny nor affirm anything in that regard! Such should be the attitude of Hume, . . ." (322). And in any case this much he said himself, and it must be heeded, that there is a distinction between the sceptic and the man, and that the working of imagination will take place in his own mind as in other human beings, with the result that some belief will be there. "So to affirm that God is the Cause of the world and that

He has established a purposive order is to use convenient expressions; it is to utilize veritable conventions" (293).

This position is substantiated in a part treating of Hume's "Moral and Religious Conventionalism". The theme is that "Morality and positive religion have their origin in certain primitive sentiments; not that man is originally a moral and religious animal, but he possesses originally certain sentiments which, when called into play, lead him necessarily towards morality and religion; these, then, are human conventions but conventions well founded, which result indirectly from human nature" (324 f.). This doctrine is found in the *Natural History of Religion*, in the *Treatise*, and in the *Inquiry concerning Morals*. The latter revealed "the conventional character of all the social virtues which are nonetheless not arbitrary; these conventions are absolutely necessary to the maintenance of social life, to the preservation of all human life, and since they are evident and strike the most obtuse intelligences, they can be called natural" (329). "The moral conventions are not original, and human reflection has been required to establish them; but their institution was necessary and still more evident and, as it were, dictated by nature" (336). "It is not being unfaithful to the thought of Hume to add to these examples the laws of experimental science and the principle of causality on which they are founded. If in effect the circumstances had been otherwise, if the constitution of the human mind had been equally different, we should be disposed according to other principles because we should have taken on other mental habits; between the permanent, irresistible, and universal principles of the imagination and the variable, weak, and irregular ones, there is no such difference as that which in logic separates the necessary from the contingent" . . . (338). "It is the same then with the essential dogmas of religion as with the moral virtues; they are artificial institutions, conventions, but not arbitrary decrees; they are founded on human nature" (345).

The concluding chapter is entitled "The Humanism of Hume". After a review of contemporary criticism the author states his own views of the purport of the avowed "scepticism". "Intelligence can sometimes produce suspension of judgment; it permits prolonged reflection; it cannot produce the definitive suspension of assent. Man is made to affirm; however, he none the less retains a durable trace of his passage through scepticism; that trace is circumspection, intellectual modesty; it is, as Hume calls it, mitigated scepticism, . . ." (366). When the sceptic faces the religious problem he finds opposed hypotheses and cannot make any decision. "But he ceases to philosophize, and becomes a man again; at once anthropomorphic theism imposes itself upon him because it is an explanation satisfying to his intelligence and to his feelings. But the sceptic is still wary of

it, and he reduces it to a single proposition which gives him neither the tranquillity nor the security of the believer. Hence he calls with all his might for a revelation, an internal miracle, an experience of a special order which might bring certitude to him, a certitude comparable to the experience which is the foundation of science. He does not condemn the appeal which arises spontaneously in him; it is manifestly the expression of a natural sentiment, and perhaps the manifestations of a reality inaccessible to intelligence; alongside of science there is place for another experience. Such is the attitude of Hume. He is above all devoted to experimental science and he rejects all explanation which is not made by causes and effects; but he knows the value of that experimental science which, as constituted by men, is only human knowledge and probably does not represent objective reality as it is. In consequence, the anthropomorphic religious explanation preserves a certain value, not in its crude form, but in a purified form . . . But one must not let oneself be deceived here, the mocking smile of the sceptic conceals a hope which scarcely dares avow itself: science does not ruin all belief. By that attitude Hume is the precursor of a state of mind very frequent in our day; it is by anticipation that he brings the deistic quarrel to a close, and that is why his rôle is important in the history of ideas: a new spiritual orientation is suggested which will later become more precise" (369 f.). "His philosophy is essentially a humanism in all the senses of the word. It was formed by study of the classics and yet failed not to follow, in their development, the sciences of nature—a living humanism which does not freeze itself in a beatific contemplation of the past. It forecasts the 'humanism' of today in refusing to follow the metaphysicians and theologians in their abstruse discussions beyond human experience, and in endeavoring to explain, by the spontaneous play of human tendencies, science, morality, and the positive religions, and in honoring the natural aspirations of the feelings which have been made uneasy over human destiny" (374).

It is undoubtedly this humanistic aspect of Hume which is constantly bringing our contemporaries back to him [illegible] one whose meaning appears to be congenial. And this account is probably as true an interpretation as it is possible to give in this day and age, with the interests and tendencies what they are. We understand Hume very much better after such a view of him both in the setting of history and in relation to our own "conventions". But others at other times have seen, and others at future times will see, an aspect that appears to be somewhat slighted in this rendering of his philosophy, and it might be well for us to hazard a critical view of this position even though we accept it—that is, we too, should play the sceptic even with our own belief.

First, a caution that we, as critics, should not read into the mind of our subject the *intention* to perform those works which we ourselves, surveying from the vantage point of subsequent history, perceive to be his achievement. "The *Treatise* and the *Essays*, like the *Dialogues*, combat deism and orthodox rationalism by scepticism" (148). And so it is said that *"the design* of Hume in his *Treatise of Human Nature"* was to define human reason and its domain (italics mine, 202). In effect, to be sure, this was so. Hume proves in the light of events to have been the critic of rationalism in every quarter, and his work an examination of the nature of human reason as it deals with the matter of experience. But it may be a mistake to regard all that as his own conscious purpose, that he set out to combat rationalism as such, that he *planned* his *Treatise* accordingly. He certainly did not express himself so. He actually spoke of his own "system", which M. Leroy indeed has so well delineated as a "conventionalism". And being truly devoted to experimental reasoning, as the author describes him, Hume was more interested in the specific questions of philosophy, the meaning of cause, substance, an external world, a self, a Deity, than in any wholesale point of view which had to be despatched by his scepticism. It is characteristic of such a thinker to attend to particulars and not to generalities; it is the historian who traffics in the latter rather than the philosopher. And perhaps we must go farther in our questioning of this position: was Hume *even implicitly* an *antagonist* of rationalism? His early examination of the maxim that a cause must exist for every beginning of existence was an instance of purely logical reasoning; his discovery was one of pure reason. Did Hume ever outgrow this early demand for a *necessity of reason!* Was he satisfied with his "system" of "conventionalism"?

Even if one adopts this "conventionalism" as the true reading of Hume one must beware of misinterpretation due to the suggestions of such a term. Convention and nature have historically been contrasting notions. The author makes it clear, to be sure, that the conventions of thought and belief in this case are perfectly "natural" and "necessary". But there is one convention which, strangely enough, is scarcely noticed in this book, namely, the belief in the continued and independent existence of a world of objects distinct from perception. Hume describes this distinction as arising within experience itself. He may not have held firmly to that view, as when he spoke of a "pre-established harmony" between perceptions and the order of Nature. But no one who expounds the *meaning* of his thought afterwards is entitled to say that, according to its principles, human science "probably does not represent *objective reality* as it is". That is suspecting the science of experience because of a fiction reared *by* experience, and it is forsaking the phenomenalist point of view which Hume

himself had just barely attained. But even supposing that he himself had lapsed into a natural realism—thinking of objects external to himself to which his perceptions ought to correspond in order to be true—even supposing he doubted such a correspondence, still he gives no evidence of having consoled himself for his scepticism with the social validity of the "conventions". Nor is there real ground to suppose that the light for which he called, the "revelation", was thought of by him as an "experience" *alongside* of science. It is more probable that he simply wanted a good and sufficient "reason". He sought, it seems, the validity of a perceived rationale, an insight. One cannot escape the notion, therefore, that Hume was a sceptic to the end of his days, and *precisely because he was a rationalist*. And perhaps it is still best to call his philosophy by the name he chose himself, a "mitigated *scepticism*".

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DESCRIPTIVE NOTICES

Nouveau traité de psychologie. Tome Troisième: Les fondements de la vie mentale. Par GEORGES DUMAS. Paris, Félix Alcan, 1932. Pp. vi, 612

This work follows the plan of the original *Traité de Psychologie* produced in 1923. The earlier work was comprised in two large volumes, rather unwieldy and printed on paper of inferior quality. The present work is planned on a much larger scale, this second volume corresponding to the second book of the first volume in the earlier work. Though sufficiently bulky it is easy to handle and much better produced.

The subdivisions of the work correspond very nearly to those adopted before, beginning with "L'excitation et le mouvement", continuing then with the subjects of sensations, affective states, and images. Apart from minor details of expansion and arrangement the only noteworthy change seems to be in the addition of a chapter on "Excitation physique et secrétions" in the first book. The work as a whole will be an encyclopaedic presentation of psychology which neither has, nor is likely to have, a rival. It demonstrates the eclectic nature of psychological interests, for in many parts it is indistinguishable from the chapters of a treatise on physiology or neurology; but the French psychologists have no prejudice against philosophical criticism and some topics lead an amphibious existence in any case. This is best seen in the section on "Images" with which this volume ends and which makes honourable mention of Aristotle, Democritus, Epicurus, Locke, Hume, and others down to James and Bergson. Philosophers who are brought by Bergson, Meyerson, Brentano, or Husserl to the border-land of psychology will be well advised to consult this concise and masterly treatise. The bibliographies are international in their scope and adequate.

G. S. BRETT

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L'orthodoxie. Par S. BOUGALKOFF. Paris, Félix Alcan, 1932. Pp. 274.

This book offers an illuminating exposition, by one within the organization, of the doctrines of Greek Christianity. It discusses fundamental conceptions, such as the Church, Ecclesiastical Tradition, the Hierarchy, the Sacraments, Ikons, making clear the unique position of Orthodoxy in its resemblances to and differences from both Roman Catholicism and Protestantism. Originating before the division of Eastern and Western branches of Christianity, and being an external spectator of the controversies of the Reformation, the Greek Church is in a position to view disinterestedly the issues between Rome and the Protestants. Lacking the international unity of the Roman organization, it is led to interpret the unity of the Church in a purely ideal sense, denying any priority to the Bishop of Rome over other Bishops of the Church, and vesting the supreme authority in the Church as a whole, represented by its councils, composed of both clerics and laics, rather than in any central office or rank, as the papacy. It frankly recognizes that the Church has changed in the course of history and that many of its present features are the products of evolution. It pro-

fesses an open mind toward the results of critical scholarship, even though it holds closely to a largely literal interpretation of the narratives of the New Testament records. It is a useful book for those who are not ordinarily in touch with this branch of Christianity.

ALBERT E. AVEY

THE OHIO STATE UNIVERSITY

Development of John Stuart Mill's System of Logic. By OSKAR ALFRED KUBITZ. Urbana, The University of Illinois, 1932. Pp. 310.

The author of this treatise is not concerned to criticize the *Logic,* but to show how "the *a priori* method, which Mill inherited from his father and Ricardo, was reconstructed during the eighteen years in which the *Logic* was developing". The introductory chapter gives an account of the historical context of the *Logic.* In Chapter II, on Logic and Psychology, it is shown that Mill's theory of classification and definition derives from his treatment of the predicables. His attempts to understand *genus* and *species* in terms of Whately's theory of essences, and by means of the doctrine of the connotation of the class name, both having failed, Mill was forced to interpret *genus* and *species* in extension. It is made plain also that, whereas in 1828 Mill held *genera* and *species* to be founded in the convenience of discourse, in 1838, after he had gone through the scientific treatment of induction, he held these *genera* and *species* to be founded in the natures of things themselves.

After a chapter on the development of Mill's theory of reasoning and syllogism, Mr. Kubitz devotes a chapter to the problem of induction in Book III of the *Logic.* Because Mill observed the distinction made by Whately between induction as inference and induction as investigation, he found it necessary so to interpret the postulate of the uniformity of nature as to make the law of causation seem to be derived from it. Mr. Kubitz concludes his skillful and enlightening treatise with a chapter on Mill's views of the method and logic of the moral sciences, and an examination of his proofs of the law of causation and of the axioms of reasoning.

RALPH W. CHURCH

CORNELL UNIVERSITY

Frédéric Rauh: Essai de biographie intellectuelle. Par ROBERT JUNOD. Genève, A. Jullien, 1932. Pp. 242.

Junod, sympathetic and acute in criticism, selects passages from Rauh's books and articles in an attempt to indicate the significance of his chief work, *L'expérience morale,* and to disengage his central idea, experience. In every realm, Rauh affirms, scholars reveal a common attitude—submission to fact; and everywhere, in moral philosophy as well as in psychology, man, the thinker, organizes data, intellectualizes matter. The essential function of philosophy is to serve as guardian of the scientific spirit. Junod discusses the relation of Rauh to other philosophers, notably to Kant, Spinoza, Bergson, Lévy-Bruhl, and to his contemporary and fellow pragmatist, William James.

NORBORNE H. CROWELL

POTSDAM, NEW YORK

La philosophie de Fontenelle ou le sourire de la raison. Par J. R. CARRÉ. Paris, Félix Alcan, 1932. Pp. 700.

Fontenelle: De l'origine des fables. Par J. R. CARRÉ. Paris, Félix Alcan, 1932. Pp. 104.

In Carré's *La Philosophie de Fontenelle ou le sourire de la raison* we have the first comprehensive study of the philosophy of Fontenelle. While Fontenelle's reputation as a writer and a wit of eighteenth century *salons* has overshadowed his renown as a philosopher, Carré maintains that Fontenelle, although never giving any systematic presentation of his philosophical ideas, possessed a definite philosophy which may be gleaned from his various writings. Already in 1686 Fontenelle presented his more important views, which then remained unchanged throughout his life.

Carré groups his discussion under three heads: Fontenelle's conception of man in the conflict between reason and instinct, his theory of nature as governed by fixed laws which render miracles impossible, his view of God as a first and final cause without any of the attributes imputed to Him by revealed religion. He preceded Voltaire and the *philosophes* in his subtle and irreverent attacks upon religion. An anticlerical, he found the doctrine of immortality improbable and that of the resurrection amusing. Under the title of Fontenelle's wisdom Carré discusses his views in fields outside of the realm of philosophy. Carré concludes with an account of Fontenelle's indirect method of attack. Although his philosophy may lack originality, his influence was wide-spread because of his tact and discretion in announcing, during the reign of Louis XIV, doctrines which were later espoused by the *philosophes* and the Encyclopedists. In the placidity and Olympic calm of this philosopher, who attained the age of one hundred years, his contemporaries saw Carré's sub-title, 'the smile of reason'.

Carré publishes the first critical edition of a small brochure entitled, *De l'origine des fables,* which Fontenelle wrote in 1680 but did not give to the public until 1724. The few pages which comprise it may have been intended as an introduction to his famous *Histoire des oracles,* since he introduced into it the subject of the comparative study of myths and thus prepared for his indirect attacks upon the miraculous elements in Christianity in the latter.

J. F. MASON

CORNELL UNIVERSITY

La vie des hommes. Par MAURICE D'ALTA. Paris, Nouvelles Editions Argo, 1931. Pp. 254.

Aspects of this book will interest readers who like the 'nature versus civilization' theme of Rousseau, the Nietzschean glorification of the superman (whom d'Alta calls *le spirigène* in contrast to *la métabrute*), or Bergsonian vitalism and flux-philosophy. *Le vion,* the ultimate reality—an indestructible energy whose emergent combinations are of infinite variety—manifests itself in the human race, the summit of the hierarchy of life. A metaphysical and biological background is given for chapters on social, educational, religious, political, economic, and miscellaneous topics relevant to the

life of man. The book is dedicated to *Les spirigènes*—those of versatile, subtle, nimble, flexible, aristocratic minds upon whom depends our salvation from the *métabrutism* of those who, subject to the tyranny of suggestion, are incapable of the motile life of reason.

PAUL A. REYNOLDS

WESLEYAN UNIVERSITY

College of the Pacific Publications in Philosophy. Volumes I and II. Lectures Delivered Under the Auspices of the Pacific Philosophy Club, 1931-32, 1932-33. Edited by PAUL ARTHUR SCHILPP. Stockton, College of the Pacific, 1932 and 1933. Pp. 158; 136.

This is a publication which will please all who enjoy the less technical dissertations of a Philosophy Club. The lectures are thought-provoking, informative, yet they have the lucidity, the social flavor, of the public forum. The lectures included are by a considerable number of speakers and cover a very wide range of subjects.

MERRILL E. BUSH

NEWARK, NEW JERSEY

Condorcet: Esquisse d' un tableau historique des progrès de l' esprit humain. Texte revu et présenté par O. H. Prior. Paris, Boivin et Cie., n.d. Pp. xxiv, 240.

The text of the *Esquisse* exists in three forms: a rough draft in autograph preserved in the library of the Institut, the first edition published in 1794, and the edition of Arago published in 1847. The first was not suitable for the printer, and whether Condorcet himself made the final draft is not known. The third contained numerous additions alleged to have been derived from a manuscript copy, but the existence of such a manuscript is now at least unknown, and students of Condorcet have suspected unjustifiable editing. The present text reprints that of Arago but indicates all important departures both from the first printed edition and from the extant manuscript. The editor, Professor Prior, of Cambridge, adds an excellent introductory essay.

GEORGE H. SABINE

CORNELL UNIVERSITY

The Religious Situation. By PAUL TILLICH. With a preface by H. RICHARD NIEBUHR. New York, Henry Holt and Company, 1932. Pp. xxvi, 182.

The author attempts to characterize briefly the fundamental faith expressed in the forms which civilization is taking, not only in religious movements within and without the churches, but also in science, philosophy, and art, as well as in politics and ethics. His point of view is denominated "belief-ful realism", an attempt to interrelate facts and ideals into an effective synthesis. The situation as a whole in European civilization is found to show dissatisfaction with old forms and a desire for a new embodiment more suitably expressive of the spirit of the present age.

ALBERT E. AVEY

THE OHIO STATE UNIVERSITY

Le rêve et la personnalité. Par MARGUERITE COMBES. Préface par ANDRÉ LALANDE. Paris, Boivin et Cie, 1932. Pp. xii. 268.

The study of dreams here given is designed to assist in the exploration of personality. Abundant testimony of a wide variety of experience is faithfully analyzed. The author argues the hypothesis that there are different dream-zones. In one psychic zone emotion dominates in the formation of dreams; the anxiety of the day gets loose at night. In another, the dreams center about one's individual course of life and the general matters which are related to it, such as marriage, character, struggles for power. In a third zone the dreams display a desire to transcend individuality and to attain personality. They express one's aspiration to be more completely noble, human. In each zone dreams form responding to a particular tendency of the self. A study of dreams is held to reveal the creative work of the unconscious. The author claims to have shown how an unconscious invention elaborates itself, and how it is related to art.

PAUL A. REYNOLDS

WESLEYAN UNIVERSITY

The Idealistic Conception of Religion: Vico, Hegel, Gentile. By ALINE LION. With a preface by CLEMENT C. J. WEBB. Oxford, at the Clarendon Press, 1932. Pp. xvi, 208.

According to the author, a student and disciple of Gentile, the speculative contributions of Vico, Hegel, and Gentile were required to establish the eternity and autonomy of religion. Hegel is criticized for making religious experience knowledge and so an inferior form of philosophy. Still, the author maintains, creed is the necessary ground of any religion. Religiousness is essential to religion, but neither mere individual religiousness nor individual religious speculation is religion, which always has actual concrete reality in history.

Over against the "empirical immanence" doctrine of the modernists, according to which God is in man while man is still other than God, the author puts "transcendental immanence", the view that God is in man as far as man transcends his empirical self and becomes one with God. Mysticism, regarded as the most characteristic form of religious experience, is said to be "the negation of man and of the individual subject, whilst it is the profound and solemn affirmation of God as the All and as the Object". In religious experience God is object and the not-self. "The unknown God is always known, but He is God only in so far as He is unknown, and stands as absolutely other to the ego that worships Him." Still, the goal of religion is always and everywhere communion, the resolution of the dualism. "The saint thinks just as rationally as the philosopher; but from his spiritual point of view he must see only the object; whereas the philosopher is in a position from which the object is always seen in its synthesis with the subject."

D. C. MACINTOSH

YALE UNIVERSITY

God in Idea and Experience, or The A Priori Elements of the Religious Consciousness. An epistemological study. By REES GRIFFITHS. Edinburgh, T. and T. Clark, 1931. Pp. xv, 300.

"Man seems to be religious by a certain ingrained necessity." The author passes in rapid survey interpretations of this fact, from the older view that the root of religion is to be found in an innate idea of God to Troeltsch's "religious a priori", which boils down to "a natural compulsion to consider things from a religious point of view". In his own view he is deeply influenced by Otto's conception of the "numinous" and by Hocking's argument that the human mind thinks of the Divine Knower by a necessity of thought. "If, in every act of knowing, we are known of an Other, all our judgments are religiously conditioned. The religious principle becomes the root of all the categories, and God as an intelligent and Infinite Being, the ultimate Subject of all predication." Similarly, "in all my acting I am owned," and "my life is lived under God who reveals to me the law of my freedom, which is God's own will, and not my own."

An empirical version of the ontological argument is introduced in the contention that for religion there is no difference between God and the idea of God, the Wholly Other of the religious mind being not a mere idea of God, but His very presence. A Trinity within the Divine Being is found in God the omniscient, God the power of righteousness, and the God of salvation. "From God the Watcher of Men, we pass to God the Lord, and from God the Lord to God the Father. But these three are One; and the greatest of these is God the Father."

D. C. MACINTOSH

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The following books were received during the months of April and May:

Essentials in the Development of Religion. A Philosophic and Psychological Study. By J. E. TURNER. New York, The Macmillan Company, 1934. Pp. 308.

Nature and Life. By ALFRED NORTH WHITEHEAD. Chicago, The University of Chicago Press, 1934. Pp. 46.

Personality, Property, and Communism. By JACQUES MARITAIN. Toronto, University of Toronto Quarterly, Vol. III, No. 2, January, 1934. Pp. 167-184.

Thomas Young, Philosopher and Physician. By FRANK OLDHAM. New York, Longmans, Green and Company, 1933. Pp. 160.

The United States and German Jewish Persecutions—Precedents for Popular and Governmental Action. Fifth Edition. By MAX J. KOHLER.

Lectures on the Meaning of God in Modern Life. Scripps College Papers. Number Five. Claremont, Scripps College, 1933. Pp. 72.

Art as Experience. By JOHN DEWEY. New York, Minton Balch & Company, 1934. Pp. xii, 356.

The Elder Henry James. By AUSTIN WARREN. New York, The Macmillan Company, 1934. Pp. xviii, 270.

On Being and Essence. By ST. THOMAS AQUINAS. Translated from the Latin by CLARE C. RIEDL. Toronto, St. Michael's College, 1934. Pp. 66.

A Bibliography of George Berkeley. By T. E. JESSOP. With an Inventory of Berkeley's Manuscript Remains by A. A. LUCE. New York, Oxford University Press, 1934. Pp. xvi, 100.

Carlyle and German Thought: 1819-1834. By CHARLES FREDERICK HARROLD. New Haven, Yale University Press, 1934. Pp. xii, 346.

The Philosophy and Psychology of Sensation. By CHARLES HARTSHORNE. Chicago, The University of Chicago Press, 1934. Pp. xiv, 288.

The Philosophy of Spinoza. Unfolding the Latent Processes of His Reasoning. By HARRY AUSTRYN WOLFSON. 2 vols. Cambridge, Harvard University Press, 1934. Pp. xx, 440; xii, 424.

A Social Basis of Education. By HAROLD SAXE TUTTLE. New York, Thomas Y. Crowell Company, 1934. Pp. x, 590.

The Chinese Renaissance. The Haskell Lectures, 1933. By HU SHIH. Chicago, The University of Chicago Press, 1934. Pp. xii, 110.

Aristotle. Fundamentals of the History of His Development. By WERNER JAEGER. Translated by RICHARD ROBINSON. New York, Oxford University Press, 1934. Pp. xiii, 410.

Yoga and Western Psychology. A Comparison. By GERALDINE COSTER. New York, Oxford University Press, 1934. Pp. viii, 250.

The Fundamentals of Psychology. By W. B. PILLSBURY. Third Edition. New York, The Macmillan Company, 1934. Pp. xiv, 664.

La pensée. Par MAURICE BLONDEL. I. La genèse de la pensé et les paliers de son ascension spontanée. Paris, Félix Alcan, 1934. Pp. xlii, 422.

La connaissance. (Mathématique, technique, humanisme, métaphysique). Par JULIEN PACOTTE. Paris, Félix Alcan, 1934. Pp. vi, 194.

Vérité et révélation. Par D. DRAGHICESCO. Paris, Félix Alcan, 1934. Pp. xvi, 494.

La nature de la connaissance et l'erreur initiale des théories. Par HENRY LEENHARDT. Paris, Félix Alcan, 1934. Pp. 352.

Essais d'esthétique de philosophie et de littérature. Par VICTOR BASCH. Paris, Félix Alcan, 1934. Pp. viii, 414.

La foule. Par GEORGES BOHN, GEORGES HARDY, PAUL ALPHANDÉRY, GEORGES LEFEBVRE, E. DUPRÉEL. Paris, Félix Alcan, 1934. Pp. 144.

Das Problem der Soziologie des Wissens. Von ERNST GRÜNWALD. Wien and Leipzig, Wilhelm Braumüller, 1934. Pp. viii, 280.

Geist und Sache. Grundlegung der Theorie der Geisteswissenschaften und Klärung des Sinnes kulturellen Schaffens. Von WILHELM GREBE. Frankfurt am Main, Moritz Diesterweg, 1934. Pp. viii, 226.

Und nochmals: Wer bin ich? Von WALDEMAR MEURER. Kirchhain, Kurt Schmersow, 1934. Pp. vi, 56.

Analecta sacra tarraconensis. Fasc. I. Ensayo Sobre las Consecuencias Físico-Matemáticas de la Teoría Tomista de la Materia y Forma. Barcelona, Biblioteca Balmes, 1933. Pp. 136.

Assaigs moderns per a la fonamentacio de les matematiques. Pel DAVID GARCIA. Barcelona, Institut d'Estudis Catalans, 1933. Pp. 56.

NOTES

The thirty-fifth annual meeting of the Western Division of the American Philosophical Association was held at the University of Indiana, March 29-31. Officers for the next year were elected as follows: President, C. B. Vibbert, University of Michigan; Vice-President, T. V. Smith, University of Chicago; Secretary-Treasurer, A. C. Benjamin, University of Chicago.

The Sixth Congress of International Moral Education will be held at Cracow, Poland, under the patronage of the Polish Government, September 11 to 14, 1934. Professors John Dewey, F. C. Sharp, and E. Starbuck are collaborating for this country with members of the International Executive Council.

The following statement has been received from Professor H. G. Townsend, Chairman of the Board of Officers of the American Philosophical Association:

The Publication Committee of the American Philosophical Association has recently been enlarged. It is now made up of A. O. Lovejoy, *Chairman*, E. A. Burtt, W. A. Hammond, D. H. Parker, and S. P. Lamprecht. The committee has also taken on an added function in connection with the American Council of Learned Societies. It will review and report to the Council on requests for publication-assistance and rotograph-service in the field of philosophy. Application for assistance in these matters will hereafter be made to or referred to the Publication Committee of the Association.

The following is a list of articles in current philosophical periodicals:

MIND XLIII 170: *W. T. Stace*, The Refutation of Realism; *L. S. Stebbing*, A Second Reply to Mr. Joseph; *T. de Laguna*, The Problem of the *Laches*; *E. V. Huntington*, Independent Postulates Related to C. I. Lewis's Theory of Strict Implication; *A. Ushenko*, Alternative Perspectives and the Invariant Space-Time.

PHILOSOPHY IX 34: *Herbert Samuel*, The Present Need of a Philosophy; *Hilda D. Oakeley*, The Leadership of Philosophy; *W. R. Inge*, Science, Philosophy and Religion; *B. Croce*, Introduction to Eighteenth-Century Aesthetic; *H. W. B. Joseph*, Aristotle's Definition of Moral Virtue, and Plato's Account of Justice in the Soul; *Gerald Cator*, Itinerarium Mentis in Deum; *O. C. Jensen*, Kant's Ethical Formalism; *R. V. Feldman*, Metaphysics of Wonder and Surprise.

THE JOURNAL OF PHILOSOPHY XXXI 6: *Ernest Nagel*, Verifiability, Truth, and Verification; *Paul Goodman*, Neo-Classicism, Platonism, and Romanticism. 7: *Clifford Barrett*, The Objectivity of Mind; *George Arthur Wilson*, The Organic Unity of Philosophy; *Jared S. Moore*, Idealism Mentalistic and "Speculative". 8: *Harold R. Smart*, Professor Pratt on Speculative Philosophy; *James Bissett Pratt*, Once More unto the Breach. 9: *C. W. Hendel*, The Status of Mind in Reality; *Sidney Hook*, What is Materialism? 10: *Haym Jaffe*, Selection among Cosmic Images; *Edgar S.*

Brightman and *Donald C. Williams*, The Self, Given and Implied—A Discussion; Abstracts of Papers Read at the Thirty-Fifth Annual Meeting of the Western Division of the American Philosophical Association, Indiana University, March 29 to 31, 1934.

The International Journal of Ethics XLIV 3: *DeWitt H. Parker*, The Metaphysics of Value I; *Joseph J. Spengler*, Have Values a Place in Economics? *R. U. Singh*, The Jurisprudence of Lorimer; *Stuart Carter Dodd*, Progress Inductively Defined.

The Hibbert Journal XXXII 3: *The Editor*, M. Loisy on the Teaching of Jesus; *S. Radhakrishnan*, The Teaching of Buddha by Speech and by Silence; *W. G. de Burgh*, Traditional Morality and Modern Life; *H. W. B. Joseph*, Purposive Action II; *Josiah Stamp*, Must Science Ruin Economic Progress? *G. I. Wade*, Thomas Traherne as "Divine Philosopher"; *Lady Vyvyan*, Solitude; *M. L. Jacks*, The Solitude and the Religion of the Public School Boy; *S. G. Warty*, Sadhu Sundar Singh's Religious Experience: A Hindu View; *M. Chaning-Pearce*, The Theology of Crisis II; *R. W. Stewart*, The Theology of Crisis: A Criticism; *G. Dawes Hicks*, Survey of Recent Philosophical Literature.

The Journal of Religion XIV 2: *William Ernest Hocking*, Christianity and Intercultural Contacts; *John Wright Buckham*, God and the Given; *Donald Wayne Riddle*, The Bearing of Recent Gospel Research upon the Study of the Teaching of Jesus; *Carl S. Patton*, Religion Looks at Theology; *Karl H. A. Rest*, The Theology of Crisis and the Crisis of Capitalism; *Bernard E. Meland*, The Appreciative Approach in Religion.

The New Scholasticism VIII 2: *Marcel Decorte*, Les Origines Ravaissoniennes du Bergsonisme; *James A. Elbert*, Berkeley's Conception of God from the Standpoint of Perception and Causation.

The Harvard Theological Review XXVII 1: *E. F. Scott*, Recent Lives of Jesus; *H. J. Rose*, Altheim: Revolutionary or Reactionary? *Arthur Darby Nock*, A Vision of Mandulis Aion.

The Australasian Journal of Psychology and Philosophy XII 1: *W. G. K. Duncan*, Liberty, Equality and Fraternity in the Modern World; *Jean Mather*, The Unconscious Significance of Fairyland II; *W. R. Boyce Gibson*, The Ethics of Nicolai Hartmann II; *J. McKeller Stewart*, Husserl's Phenomenological Method II; *A. S. Le Souef*, Notes on Ape Mentality.

Philosophy of Science I 2: *Henry Margenau*, Meaning and Scientific Status of Causality; *L. Kattsoff*, Concerning the Validity of Aristotelian Logic; *Albert Einstein*, On the Method of Theoretical Physics; *William Marias Malisoff*, An Examination of the Quantum Theories II; *N. Rashevsky*, Foundations of Mathematical Biophysics; *Oliver L. Reiser*, Time, Space and Gestalt; *A. Cornelius Benjamin*, The Mystery of Scientific Discovery; *John Dewey*, Meaning, Assertion, and Proposal; *Paul Weiss*, A Home for Logic.

Speculum IX 2: *H. S. Lucas*, Diplomatic Relations of Edward I and Albert of Austria; *J. S. P. Tatlock*, Geoffrey of Monmouth and the Date of *Regnum Scotorum*; *S. H. Thomson*, Grosseteste's Topical Concordance

of the Bible and the Fathers; *Arpad Steiner*, The Date of Composition of *Mandeville's Travels*; *E. N. Johnson*, Adalbert of Hamburg-Bremen; *A. S. C. Ross*, A Theory of Emendation; *Lynn Thorndike*, A Mediaeval Sauce-Book; *Ethel D. Roberts*, Notes on Early Christian Libraries in Rome; *U. T. Holmes*, Mediaeval Gem Stones; *J. J. H. Savage*, Mediaeval Notes on the Sixth *Aeneid* in *Parisinus* 7930; *E. V. Moffett*, A *Bulla* of Otto III in America.

THE BRITISH JOURNAL OF PSYCHOLOGY XXIV 4: *M. D. Vernon*, The Binocular Perception of Flicker; *George Seth*, An Experimental Study of the Control of the Mechanism of Speech, and in particular of that of Respiration, in Stuttering Subjects; *J. Leycester King*, A New Phonic Chronoscope; *C. Spearman*, The Battle between 'Intuitionists' and 'Psychometrists'; *Douglas Fryer*, A Genetic Study of Motivation under Changing Auditory Situations; *Dael L. Wolfle*, The Role of Generalization in Language; *Edgar Rubin*, Some Elementary Time Experiences.

THE AMERICAN JOURNAL OF PSYCHOLOGY XLVI 2: *H. Goldhamer*, The Influence of Area, Position, and Brightness in the Visual Perception of a Reversible Configuration; *H. Cason*, Association in Relation to Feeling and Gross Bodily Movement; *L. J. Stone* and *K. M. Dallenbach*, Adaptation to the Pain of Radiant Heat; *L. D. Goodfellow*, An Empirical Comparison of Audition, Vision, and Touch in the Discrimination of Short Intervals of Time; *M. L. Billings*, Problem-Solving in Different Fields of Endeavor; *L. S. Woodburne*, The Effect of a Constant Visual Angle upon the Binocular Discrimination of Depth Differences; *D. W. Chapman*, The Statistics of the Method of Correct Matchings; *S. H. Britt* and *M. E. Bunch*, Jost's Law and Retroactive Inhibition; *S. W. Fernberger*, New Phenomena of Apparent Visual Movement; *A. Silverman* and *H. Cason*, Incidental Memory for Pleasant, Unpleasant, and Indifferent Words; *R. Stagner* and *J. Pessin*, The Diagnostic Value of Introversion-Extraversion Items.

PSYCHOLOGICAL REVIEW XLI 2: *R. S. Woodworth*, Howard Crosby Warren; *Stephen C. Pepper*, The Conceptual Framework of Tolman's Purposive Behavorism; *Clark L. Hull*, The Concept of the Habit-Family Hierarchy and Maze Learning II; *Israil Latif*, The Physiological Basis of Linguistic Development and of the Ontogeny of Meaning II; *Max F. Meyer*, Frequency, Duration and Recency vs. Double Stimulation; *Elizabeth Duffy*, Emotion: An Example of the Need for Reorientation in Psychology; *Edwin R. Guthrie*, Pavlov's Theory of Conditioning. 3: *Herbert Shuey*, Recent Trends in Science and the Development of Modern Typology; *Roger M. Bellows* and *Ralph G. Whisler*, A Consideration of Interacting Pattern Theories of Feeling and Emotion; *Israil Latif*, The Physiological Basis of Linguistic Development and of the Ontogeny of Meaning III; *Karl C. Pratt*, Specificity and Generalization of Behavior in New-Born Infants: A Critique; *Milton Harrington*, A Mechanistic View of the Problem of Mental Disorder; *H. Barry, Jr.* and *W. A. Bousfield*, Implications of the Flight of Colors; *C. Spearman*, Professor Tryon on Factors.

JOURNAL OF EXPERIMENTAL PSYCHOLOGY XVII 2: *H. Woodrow*, The Temporal Indifference Interval Determined by the Method of Mean Error;

C. C. Lienau, Singer's Definition and the Generalized Law of the Geometric Mean in Numerical Estimation; *R. O. Van Waters*, Visual Perception of Horizontal Movement; *M. Metfessel* and *N. D. Warren*, Over-Compensation by the Non-Preferred Hand in an Action-Current Study of Simultaneous Movements of the Fingers; *C. W. Manzer*, The Effect of Fatigue upon Variability of Output in Muscular Work; *H. Gurner*, Thresholds of Vertical Movement of the Body; *S. W. Fernberger, E. Glass, I. Hoffman* and *M. Willig*, Judgment times of Different Psychological Categories; *J. B. Stroud, A. F. Lehman* and *C. McCue*, The Reliability of Nonsense-Syllable Scores; *C. Van Riper*, A New Test of Laterality.

PSYCHOLOGICAL BULLETIN XXXI 3: *Georgene H. Seward*, The Female Sex Rhythm; *Albert A. Campbell*, The Personality Adjustments of Only Children. 4: *J. Garton Needham*, The Time-Error in Comparison Judgments; *Joseph Jastak*, Interferences in Reading.

REVUE DE MÉTAPHYSIQUE ET DE MORALE XLI 2: *É. Meyerson*, Philosophie de la Nature et Philosophie de l'Intellect; *H. Kelsen*, La méthode et la notion fondamentale de la théorie pure du droit; *J. Rouge*, Le culte du "moi" et la culture du "moi" chez Frédéric Schlegel; *L. Leprince-Ringuet*, Les constituants de la matière.

REVUE PHILOSOPHIQUE LIX 3 and 4: *J. Laporte*, Le scepticisme de Hume II; *J. Pacotte*, L'idée de science de la technique; *R. Ruyer*, Rôle du sens commun en philosophie; *H. Perls*, Μοῦσα, étude sur l'esthétique de Platon.

REVUE D'HISTOIRE DE LA PHILOSOPHIE ET D'HISTOIRE GÉNÉRALE DE LA CIVILISATION N. S. IV: *Fr. Préchac*, Un manuscrit inédit du *De clementia*; *J. Gay*, Pétrarque et les papes français; *René Jasinski*, Sur la philosophie de La Fontaine dans les livres VII et XII des Fables I; *René Hubert*, Introduction bibliographique à l'étude des sources de la science ethnographique dans l'Encyclopédie (fin); *Henry Laufenburger*, Fascisme italien et national-socialisme allemand.

ARCHIVES DE PSYCHOLOGIE XXIV 33-94: *Ed. Claparède*, La genèse de l'hypothèse; *E. Sperantia*, Les théories personnalistes en Roumanie. La psychologie de M. Radulescu-Motru; *C. Spearman*, Collaborons à la psychologie individuelle; *Ed. Claparède*, Le X^e^ Congrès international de Psychologie et la terminologie psychologique.

SCHOLASTIK IX 2: *Franz Sal. Mueller*, Die Unbefleckte Empfangnis Marias in der syrischen und armenischen Überlieferung; *Artur Landgraf*, Die Unterscheidung zwischen Hinreichen und Zuwendung der Erlösung in der Frühscholastik; *August Brunner*, Die Struktur des objektiven Geistes und der Objektivationen; *Franz Pelster*, Neue Schriften des englischen Franziskaners Richardus Rufus von Cornwall (um 1250); *Bernhard Jansen*, Sein und Wert.

LOGOS XVI 4: *Cleto Carbonara*, Morale e religione nella filosofia di H. Bergson; *Franco Lombardi*, Il problema di Kant e il concetto dell'idealismo trascendentale; *Aprile Giuseppe*, Riflessioni sul problema del moto assoluto; *Emil Erich Hölscher*, La statica e la dinamica del diritto; *Adriano Tilgher*, Il tempo; *Eugenio Di Carlo;* Il primo scritto di Cosmo Guastella;

Eugenio Garin, Il concetto dell'Io nell'empirismo inglese; *Michele Frederico Sciacca,* Il problema dell'arte nella filosofia di Tommaso Reid.

GIORNALE CRITICO DELLA FILOSOFIA ITALIANA XV 1-2: *G. Gentile,* Poesia e genio; *E. Bignone,* Alla riconquista dell' Aristotele perduto; *R. De Mattei,* L' "Istruzione contro i Gesuiti" e il Campanella; *C. Motzo Dentice di Accadia,* Il deismo inglese del Settecento; *I. Baggio,* L'idealismo concreto di P. Carabellese II[a]; Le Opere Maggiori; *M. Federico Sciacca,* Lo Stato, l'individuo e l'attualismo.

RIVISTA DI FILOSOFIA NEO-SCOLASTICA XXVI 1: Cronaca della Facoltà di Filosofia dell'Università cattolica del Sacro Cuore; *P. Bartolomei,* "Esiste una 'filosofia cristiana'?"; *A. Del Noce,* Nota sull'anticartesianismo di Malebranche; *A. Rossi,* Studio critico sulla gnoseologia (o psicologia pura della conoscenza propria e attuale) di Giuseppe Zamboni; *R. Bizzarri-F. Olgiati,* San Tommaso e l'arte; *La Redazione,* Un importante nuovo volume di A. Carlini; *C. Mazzantini,* Filosofia e filosofia della storia.

ANNALI DELLA R. SCUOLA NORMALE SUPERIORE DI PISA III 2: *G. Vitelli,* Nuovi frammenti degli Αἴτια di Callimaco; Dai papiri della Società Italiana; *C. Pellegrini,* Il gruppo di Coppet; *L. Borghi,* La dottrina morale di Coluccio Salutati.

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